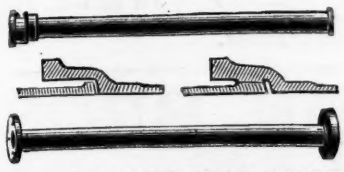
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXI. No. 1826.] LONDON, MAY 10, 1898. [50TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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Shipping Ports: All the principal Scotch Ports.

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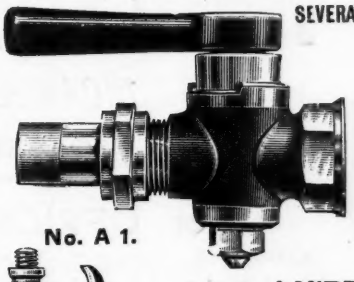

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FULL-WAY

AS SHOWN.

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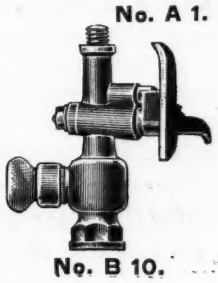

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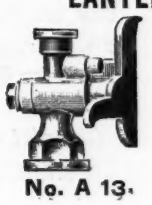

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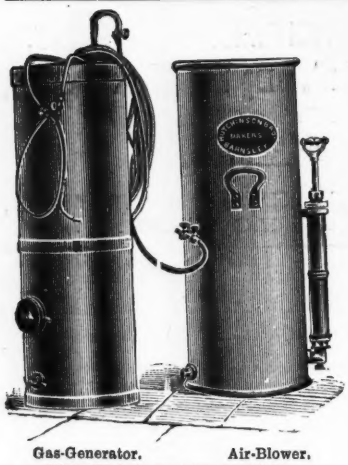

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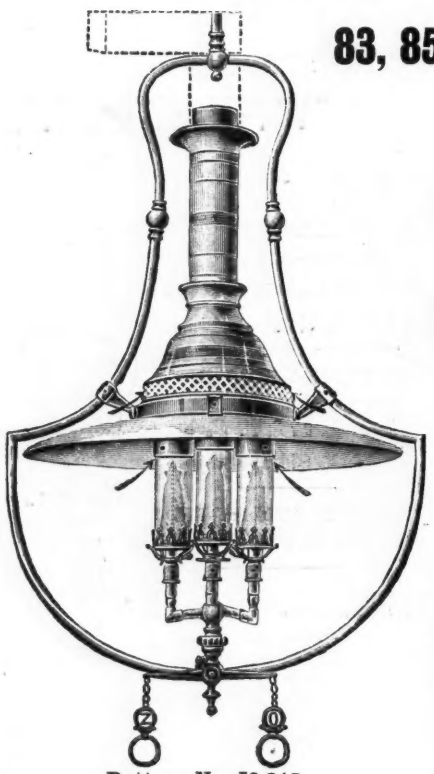

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VENTILATING GAS-LAMP

FOR INCANDESCENT GAS-LIGHT.

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Abstracts the heated Products of Combustion, and keeps Apartments lighted with it perfectly cool.

For Window Casements, preventing the steaming of Windows.

Very attractive in appearance.

Made for One, Two, or Three Burners, with or without Pilot Light.

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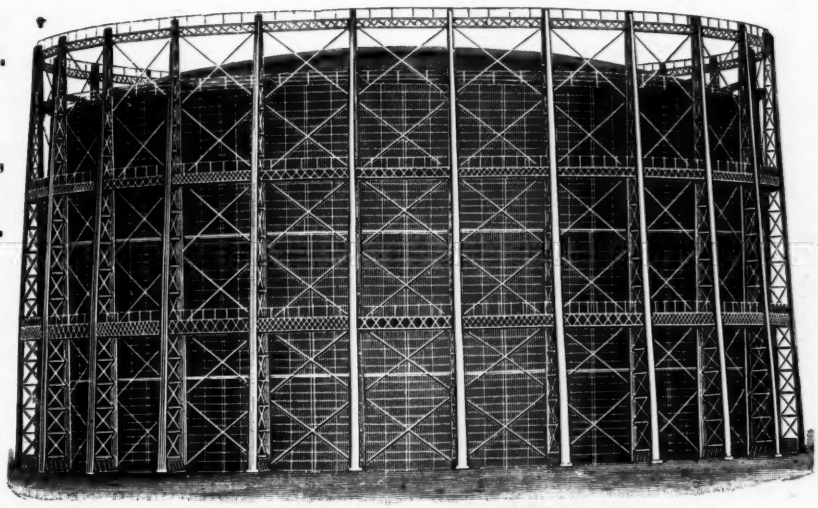

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240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

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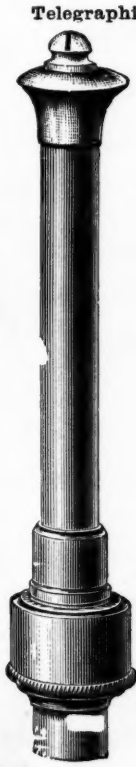

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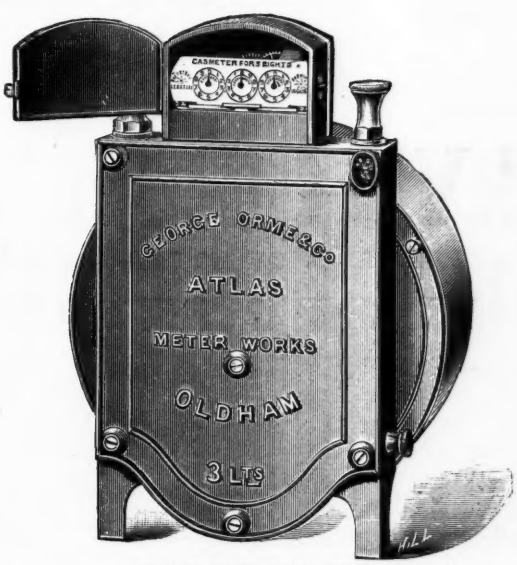

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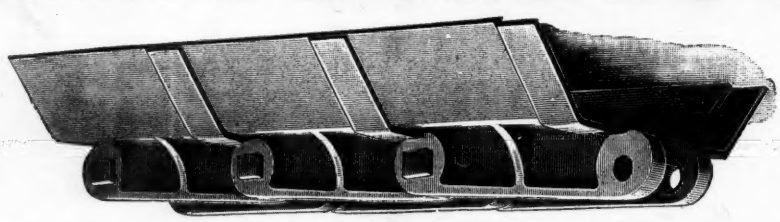

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Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

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THORNLEY GAS COALS

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Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

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FOR

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RECOVERY OF SULPHUR,

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Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

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STEEL OF ALL DESCRIPTIONS.

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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WELLS' LIGHTNING PAINTER

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PAINTING BY MACHINE.

GREAT SAVING IN TIME, PAINT, AND LABOUR.

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Paint Machine, attached to a Single Air-Compressor, Driven by Belt Power. Can also be driven from existing Air Mains.

No. 1	Painter	£23	Single Air Compressor	£17 10
No. 2	„	£30		
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Supplied to 6 Governments, the principal Railway Companies, Gas-Works, and leading Firms in Great Britain.

Over 180 Plants Sold.

Vertical Steam-Engine and Air-Compressor combined with Boiler on Wheel Base. Price, complete with all Fittings, £100. No. 2 Painter, extra, £30.

Hand Compressor and Paint Holder and Sprayer combined, for Stencilling Letters, Ornamental Designs, Decorative Work, and any class of Painting where the work is not very heavy or continuous £20

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NEW POPULAR PRICES.

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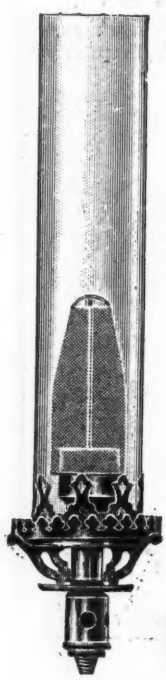

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3/10 each.

WITH BYE-PASS, 5/-.

MANTLES

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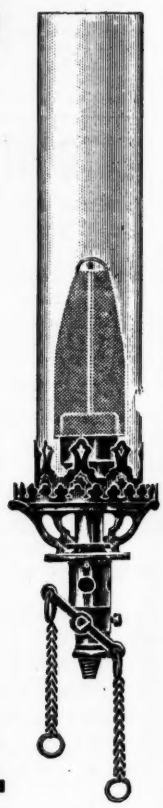

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SUNLIGHT MANTLES

PRODUCE A DIFFUSED LIGHT OF SOFT RAYS,

The NEAREST APPROACH to the LIGHT of the SUN.

Price Lists, &c., on application.

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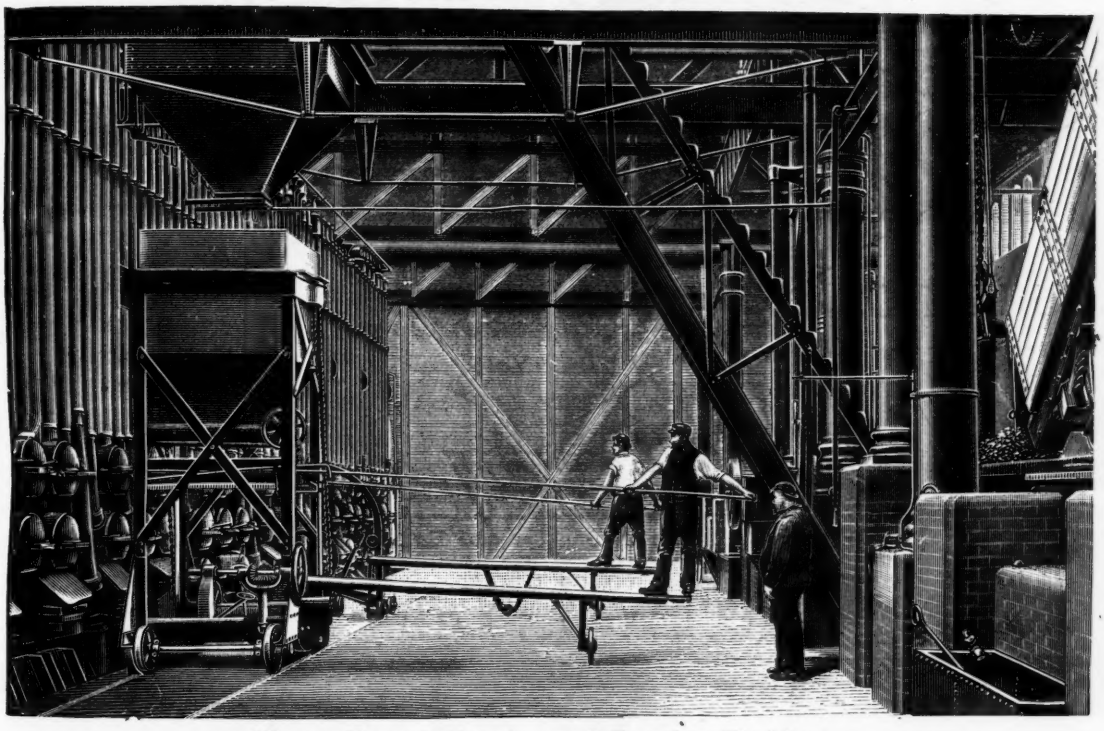

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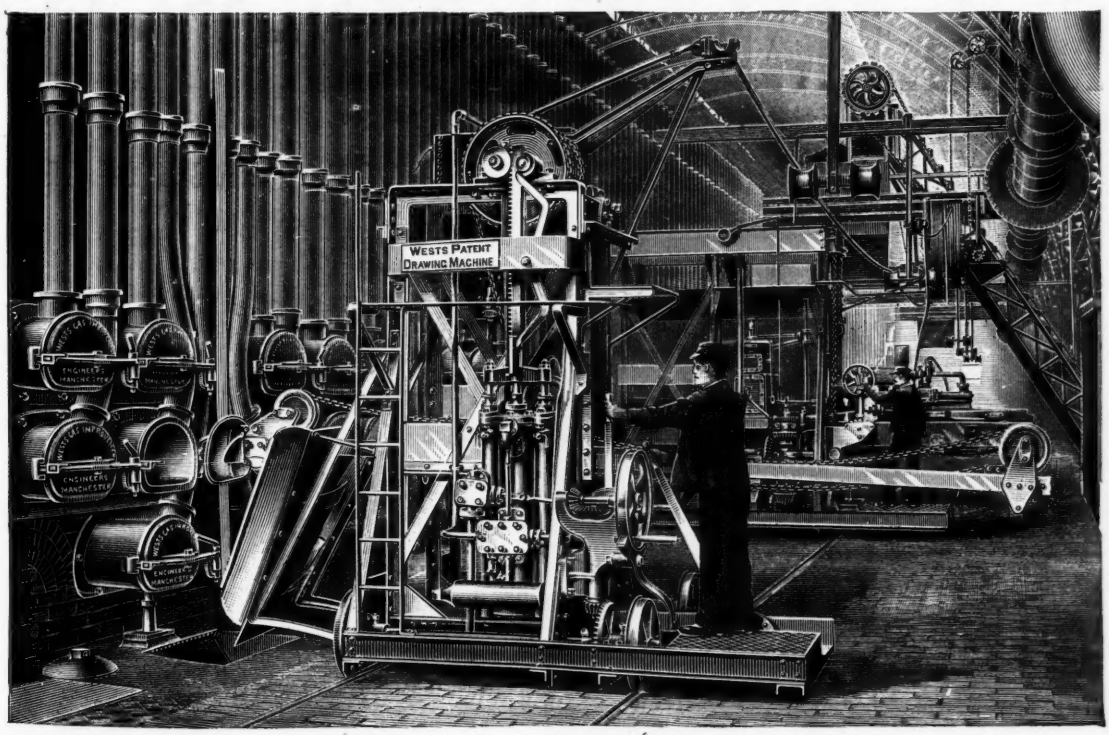

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Breakers, Elevators,
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WE GUARANTEE
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We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

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PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
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4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
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8. Index showing number of Pennies in the mechanism at any time.
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GUARANTEED FOR FIVE YEARS.

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IMPROVEMENTS IN STREET LIGHTING.

Highest Efficiency with Greatest Economy.

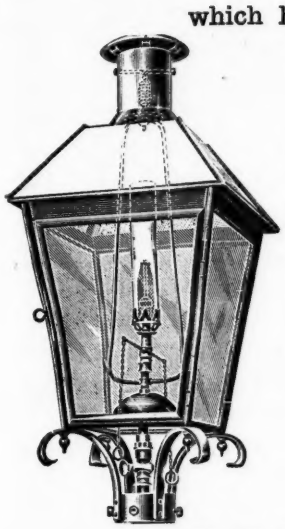
LIGHTING AUTHORITIES, GAS ENGINEERS, and GAS MANAGERS

are invited to inspect the

INCANDESCENT GAS-LIGHT

(Welsbach System),

which has now been successfully adapted to the purposes of

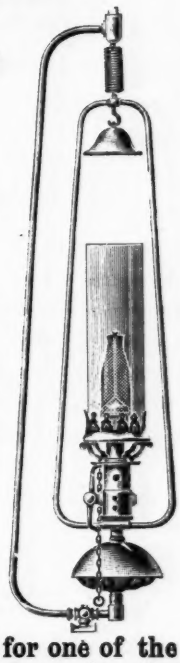


STREET LIGHTING,

the difficulties caused by VIBRATION having been OVERCOME by the use of the

NEW SPRING SUSPENSION FRAME (Patent).

This System of Lighting meets the requirements of all Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting WITHOUT INCREASE OF EXPENDITURE.



The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{6}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{6}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

"In the matter of cleaning, it may be said that the lanterns require less attention than with the ordinary flat-flame burner."

"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

FOR PRICES AND PARTICULARS, APPLY TO THE

INCANDESCENT GAS-LIGHT CO., Ltd.,

Palmer Street, Westminster, London.

KIRKHAM, HULETT, & CHANDLER, Ld.

8 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

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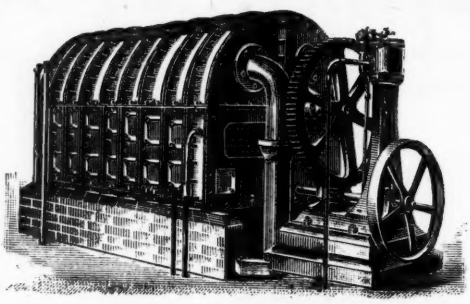

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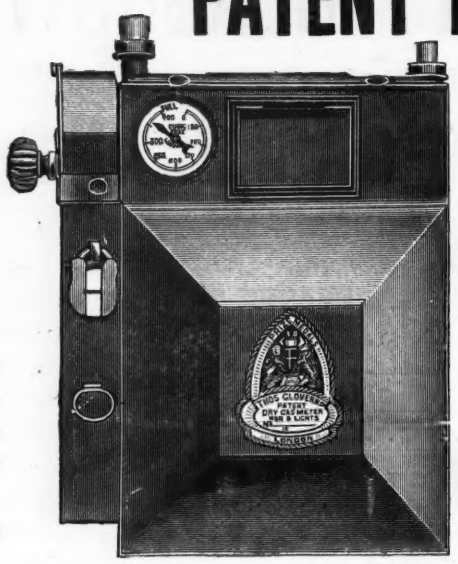

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EDITORIAL NOTES.

The Gaslight and Coke Company's Bill in Committee.

THE Bill of The Gaslight and Coke Company yesterday came before the House of Commons Committee presided over by Mr. Johnson Ferguson. Owing to an accidental difficulty in respect to the formation of a quorum, the proceedings, instead of commencing at the usual time, had to be adjourned over the luncheon hour. This mishap cut the day sadly to waste; but Mr. Pope, Q.C., who led for the Company, made up for lost time by condensing his introductory speech into the most concise shape. He began by explaining the object of the Bill, and defending the process of stock conversion generally. Then Counsel dealt with the opposition of the London County Council, quoting largely from the speech of Mr. Worsley Taylor, Q.C., on the South Metropolitan Bill of last year. This precedent was relied upon as clearing the ground for the present Bill. The proper comprehension of the case by the Committee was facilitated by the circumstance that the Chairman of the present Committee was a member of the Committee on the South Metropolitan Bill, which was accepted by Parliament. Mr. Pope's case was, simply, that there was no good reason why the London County Council should oppose the Bill, in view of the acceptance of the principle of stock consolidation and conversion by Parliament in so many instances. Counsel deprecated the introduction by the County Council of the question of the price of gas, or any similar matter, into the discussion of this "domestic" Money Bill. It was not denied that the passing of the Bill would confer some benefit upon the owners of the Company's stock, by rendering it more marketable; but Counsel indignantly protested against the immoral doctrine that any *quid* for the public should be attached to the realization of such a *quo* for the proprietors. At the conclusion of Mr. Pope's speech, Mr. J. W. Field, the Secretary and General Manager of the Company, was called and examined in support of the Bill by Mr. Balfour Browne, Q.C. The Governor, Colonel Makins, was present and tendered as a witness to the merits of the preamble; but in view of the consideration that the nature of the Bill is wholly financial, and largely a mass of detail, it was preferred to begin with Mr. Field's testimony upon the facts. This was brief, and was directed to show that the Company, as such, would not benefit directly by the Bill—certainly that the public would not be prejudiced in any sense. Mr. Littler, Q.C., cross-examined Mr. Field for the Corporation of the City of London; one of the points pressed being the effect of the abolition of the coal dues. Upon the point of the probable appreciation of the Company's stock as the result of the passing of the Bill, witness, on the basis of the South Metropolitan and Crystal Palace Companies' experiences, denied that it had had any specific value. Mr. Worsley Taylor, Q.C., for the London County Council, followed, and raised the question of the propriety of taking a converted capital as representing the actual capital expenditure of the Company to which it appertains. He also traversed the statement that the Bill would not be of any advantage to the Company. The proceedings lasted the rest of the day. Mr. Field was the only witness called by the promoters; and his evidence constituted the case for the Bill.

Mr. Livesey's Answer to Colonel Makins.

THE promised letter by Mr. George Livesey in answer to Colonel Makins, and upon some points of the "Reply" of The Gaslight and Coke directorate, will be found in our "Correspondence" columns. It deals in order with the charge of inadequate testing as regards South Metropolitan gas; with the allegation that by using 3-light prepayment meters the South Metropolitan Company are requiring their customers to pay for more gas than is actually consumed; and with Mr. Livesey's attitude in regard to meter-rents. The foregoing are matters of general interest, and the issues are not complicated by any personalities. It is unhappily different with regard to the subject of the rest of Mr. Livesey's letter, except the concluding portion. In order to impugn Mr. Livesey's motive in attacking the officials whom he holds responsible for the actual state of the undertaking, Colonel Makins at the meeting mentioned the Nine Elms case. He did so in language that stands recorded in our report of these proceedings; referring at the same time to a letter written by Mr. Livesey to the

late Mr. J. Orwell Phillips. It is incumbent upon everybody who has followed this quarrel to read and mark what Mr. Livesey now has to advance with respect to Colonel Makins's treatment of his letter, the text of which (with an unimportant omission) is published for the first time. We shall keep to our rule of non-intervention in this personal affair; but it will certainly be asked by everybody who now makes acquaintance with the facts—why, in the long period taken by Colonel Makins in preparing his reply, he did not follow the ordinary course of asking the writer of a letter which it was designed to use whether he had any objection to its publication. To profess to withhold a letter because it is private, while yet giving its substance, is not usually regarded as quite the right thing to do, even if the disclosure is substantially correct. When, however, as in the present instance, an important word is changed for others of much lower signification in connection with the matter, and a qualifying sentence is left out, the performance can only be judged in one sense. With regard to another matter in connection with the Nine Elms case, Mr. Livesey shows that the "Reply" reverses the order of date of the arbitration and award and the general meeting at which the proprietors expressed a wish to drop these proceedings.

Lastly, Mr. Livesey returns to the real question at issue —the quality of the administration of The Gaslight and Coke Company. He shows that, with the solitary exception of the Company who notoriously have the most straggling district of supply in the kingdom, the largest Gas Company in the world charge a price for their gas which compares unfavourably with that of other undertakings. Worse still, while numerous instances of reduction in price since the year 1896 have occurred, he believes "there is no case in the United Kingdom of "an increase of price since then, except the solitary "Chartered." With this raking broadside—to repeat Colonel Makins's metaphor—Mr. Livesey leaves the Horseferry Road administration to think it over. For himself, he declares that nothing but the most urgent necessity will compel him to continue the correspondence; which is a wise decision. These controversies infallibly lose point if unduly prolonged. Mr. Livesey has surely done enough for honour. The responsibility which he leaves upon the shoulders of every individual Director of The Gaslight and Coke Company is not pleasant to contemplate; and it must be painfully heavy and vexatious to live under. The "time is out of joint" in this undertaking for the comfortable, easy-going fashion of attending the Court and drawing the fees which constitutes the common rule of directorial conduct of the affairs of a company. Whether the Chartered Directors are men of business, with a real grip of the fortunes of the Company, or ciphers, should now appear. There is not much hope of them, after their astounding complaisance in allowing the "Reply" to go forth to the world; but time will show how far their complaisance is capable of stretching.

The Gaslight and Coke Company and the House of Commons.

In the House of Commons last Thursday, Mr. Pickersgill, the member for South-West Bethnal Green, asked the President of the Board of Trade whether, in accordance with his promise given on April 5, he had considered the question of instituting an inquiry into the past and present management and working of The Gaslight and Coke Company, "with a view to putting an end to the system whereby "gas consumers on the north side of the Thames had to "pay 3s. per 1000 cubic feet, as against 2s. 3d. per 1000 "cubic feet on the south side;" and whether he was now in a position to make an announcement on the subject. In reply, Mr. Ritchie said: "The Board of Trade have been "carefully considering this question. They have no statu-"tory power to hold an inquiry. If the hon. member "thinks it desirable to move for a Committee of this House, "I will see that the proposal receives careful consideration." Up to the time of writing, Mr. Pickersgill had not put upon the paper any such notice as that invited by the President of the Board of Trade. Referring to the proceedings of Parliament about the date mentioned, it will be found that Mr. Ritchie had first to reply to a suggestion that a Committee should be appointed to inquire as to the prices charged and profits made by the Company for the last ten years; and to this the answer was that such a Committee did not seem necessary, as the information desired could be had in the form of a return. Subsequently, the Board of Trade received certain resolutions passed at a conference of delegates from Local Authorities north of the Thames, to which he promised to give careful consideration "with a "view to seeing whether or not the desire of the memorialists "could be acceded to." This was the engagement referred to by Mr. Pickersgill. The official answer is in the sense that we predicted for it at the time. The Board of Trade have no statutory authority for holding an inquiry of the kind; but, of course, a Committee of Parliament can investigate anything which has been, is, or may be, the subject of legislation. Such a Committee can send for persons and papers, and make its investigation as thorough as it pleases. It may, however, be doubted whether Parliament will be asked to undertake during the present session an inquiry into the affairs of a Company which must at no distant date apply for further capital. Not only is the session already far advanced, with so much work in hand that in all probability no more legislation will be proposed; but it is obviously desirable that the regular course of Private Bill legislation should not be interfered with for the sake of precipitating a result by a few months. It would be improper to anticipate what may happen to The Gaslight and Coke Company when they go to Parliament for more money; but at least it may be said that it will be a more natural process to bring the administration to book upon its own application, than to make it the unwilling victim of gratuitous vivisection.

Workmen's Compensation Insurance.

The subject of the evaluation of the additional charges to be borne by gas manufacturers under the Workmen's Compensation Act, introduced to the North of England Gas Managers' Association by Mr. T. Bower, as recorded in last week's "Journal," has received further treatment by Mr. George Livesey, whose letter to "The Times" on the result of nine months' working of the South Metropolitan accident fund appears in another column. The statement of Mr. Livesey is calculated to attract the attention of all employers of labour in a large way. It is, on the face of it, early to discuss the results of an accident fund after only nine months' working. But yet, as Mr. Livesey remarks, 4000 men will in this time give a very fair indication of how they intend to "shape" under a new dispensation. The writer's main point is that the framers of the Act are to be most heartily congratulated on their wisdom and foresight in excluding the first fortnight from compensation. With this opinion, everybody will agree. The petty malingerer is the plague of all insurance schemes, especially of those which he partly pays for. There is, as police court proceedings remind us daily, an enormous amount of small meanness and despicably puny roguery in the world. This is not confined to one class or order of the community; and we should be very loth to accuse gas workers of being worse in this respect than many who might be expected to be superior to the temptation to make a shilling or two by cheating. More especially is this crying evil manifested when a public company, or the Government, is the victim. As many Judges and Magistrates have observed, people seem to have no hesitation in defrauding a company, when they would "scorn the "action" of picking a friend's pocket. After all the clamour about progress and culture, and all the rest of it, the real want of the world still is a more thorough and hearty practice of the simple precepts of common honesty.

In the South Metropolitan case, the trouble is doubtless due in part to the tendency of persons new to insurance to desire to "see something for their money." Lord Beaconsfield once spoke scathingly of the "ignorant impatience of "taxation" which prevails in communities existing under the most economical system of government. There is extant an even greater degree of ignorant impatience of the cost of insurance against loss by accident and other hazards of life in a civilized community. One might almost go so far as to say that many an insurer feels disappointed, when called upon for his yearly premium, at not having been able to make a claim since his previous payment. At the same time, there is unquestionably a growing feeling of impatience with the doings of the old-established insurance companies, which does not spring from ignorance. It is felt by the commercial and industrial community that the business of insurance needs reforming. This feeling will be intensified by the intelligence that those insurance companies who are disposed to launch out into the unknown ocean of workmen's compensation, will only do so on the inducement of

premiums calculated on a rate which employers of labour have every reason to regard as exorbitant.

The greatest evil of the insurance business, as ordinarily conducted, is the expense of management, which includes the cost of securing new business. The next greatest evil is the necessity for making big dividends for the original shareholders. Between the expenses and the dividend, the insurance manager feels himself pinched; and no wonder. The expedient of mutual insurance has often been proposed as a remedy for the timidity of fire offices in regard to the risks of a particular trade; but, obviously, fire insurance confined to a special description of risk is not an enterprise in which a prudent man would put his money. Insurance (say) of gas workers, under the Workmen's Compensation Act, is a different matter. It is to be gathered, from what has been published in this regard, that the Associated Insurance Offices are agreed not to take this risk for a less premium than 25s. per cent. of the wages paid. This charge we have no hesitation in pronouncing absurd. Mr. Livesey's letter already referred to does not contain the data necessary to determine what the price of compensation really is, even including the cost of a certain amount of malingering. Companies on the scale of the South Metropolitan, however, will find this out for themselves in due time. With regard to other gas undertakings, the suggestion that they should enter into mutual arrangements for insurance on a tentative scale of premium is sensible, if feasible. The latter consideration is of a legal character, and needs careful examination from this point of view.

The Question of Tar.

Has it occurred to many of our readers to ask themselves seriously what the coal tar trade is coming to? If not—to employ a familiar form of putting the question—why not? Take the quoted prices of tar in successive issues of the "Journal." Prices have never been lower. At a former time, when the value of tar in the market has been nearly as low as it is to-day, there was a warm polemic upon the expediency of getting rid of it by burning. Tar is certainly down to its fuel value again, and yet nobody talks of systematically keeping it off the market. This is curious. Moreover, there is no sound of novel processes for using tar to carburet coal gas, or in the manufacture of carburetted water gas. Does this apathy in regard to what was some years ago a "burning question" mean that producers of gas-works residuals have relinquished the hope of being able to control their value in any way, independently of the distillers? If this is the case, it would be interesting, for academical reasons at any rate, to have the fact upon record. The problem of coal tar is, on all counts, a puzzling one. With the discovery of even more and more useful products to be obtained from it, the value of the commodity gets less and less. People who talk from platforms so glibly about the wonders that applications of chemical science have wrought for the synthetic colours and drugs trade of Germany, and clamour for the acclimatization of these industries in this country, do not know what tar fetches withal. Query: If all this applied science has done so much for tar, what may be supposed to be the effect of more of the same kind of treatment?

The Iron and Steel Institute.

The Iron and Steel Institute are among the earliest of the technical organizations of the country to hold their annual meeting. This took place last week at the Institution of Civil Engineers, under the presidency of Mr. E. Martin. The proceedings of the Institute touch gas engineering at many points. This year a tangent was disclosed in a paper by M. Adolphe Greiner, the Director-General of the famous works of the John Cockerill Company, Belgium, on the use of blast-furnace gas for the production of motive power. It is claimed that the first successful experimental application of blast-furnace gas to the direct production of motive force was made at these works so recently as just before last Christmas. Seeing that the average gas production of blast-furnaces amounts to nearly 160,000 cubic feet per ton of iron made, and that the calorific power of the gas is taken to be nearly one-half that of common coal gas, it does not seem chimerical to hope that the cost of producing iron and steel may be reduced by the utilization of this fuel for all the purposes of iron-works. The claim of the Cockerill Company for priority in this development is disputed; it being stated that gas-engines have been worked regularly by blast-furnace gas in England since February, 1895. Another subject of common interest for gas and iron makers is the production of coke with recovery of the bye-products. Mr. John H. Darby, of Brymbo, brought this topic before the meeting; admitting that there is a difference between the appearance, and also the reputation, of coke made in the beehive oven and in a retort. In the course of the discussion on the paper, Sir Lowthian Bell asked Sir Bernhard Samuelson what, in his experience, this difference amounted to in actual value. The reply was that the superiority of beehive coke is certainly not greater than 5 per cent. of the value. This is an important statement.

WATER AND SANITARY AFFAIRS.

According to the evidence given before the Metropolitan Water Supply Commission last week, by Sir Arthur Arnold, the County Council is in every respect qualified to take charge of the water supply of the Metropolis. It is a business-like body, despite its irregular methods with the wages of the parks employees; it is not overworked, though occupied with multitudinous functions; neither is it political and partisan in its character. This is a good testimonial; but it is a subject upon which opinions will differ, and Mr. Whitmore is quite as likely to be right as Sir Arthur. Mr. Shirley Murphy, the Medical Officer of Health for the Administrative County, in like manner maintained the admirable character of the County Council. He agreed with Sir Arthur that the present system by which the water supply of the Metropolis is examined, failed to secure the purity of the supply; and he went on to lay down the principle that the water-owning authority and the disease-preventing authority should be one and the same. Having in view the County Council as possessing the water supply, Mr. Murphy thus declared his confidence in that body as the corrector of its own faults. Viscount Llandaff put the question in a form which implied a conviction that it might be better for the power of correction to be in other hands than those of the delinquent. It is well for the public thus to be informed as to the kind of guarantee the County Council is prepared to give respecting the purity of the supply. Witnesses for the Council argue that the present system by which the Local Government Board take the lead in the examination of the supply is insufficient to secure its purity. Yet all that is offered by way of exchange is for the supply to be placed under the absolute control, and in the actual possession, of the County Council. Mr. Murphy would have "no hesitation" in thus leaving the Council to be its own supervisor; yet in so doing he has to answer, not only for the present Council, but for all future Councils. The virtue must be hereditary; and the triennial election must not impair its continuity. That the existing method by which the supply is left under inspection really answers its purpose, is proved by the evidence of Mr. Murphy himself, who admits that the annual enteric death-rate in London is exceptionally low. To this fact he can only append the possibility that it might become very high in the future. For the present Mr. Murphy is not able to contend that those who drink water from the Thames are less healthy than those who have a supply from the chalk. Accordingly, we are led to conclude that the present state of things is satisfactory. Neither is there any sufficient reason given why the supply should degenerate in the future, supposing it remains with the Companies, and is not transferred to the uncontrolled possession of the Council.

The general drift of the evidence before the Royal Commission is evidently apprehended at Spring Gardens as tending in an opposite direction to Progressive designs. In the discussion on the Council's Budget last Tuesday, Mr. Beachcroft took exception to the large estimated expenditure—amounting to £4000—on account of attending and preparing evidence for the Royal Commission on the Water Supply. On this Mr. Stuart remarked that no one objected to the expenditure more than the Progressive party, because they knew perfectly well that "the Commission "was appointed to throw out the Council's Water Bills." We apprehend that the real grievance lies farther ahead, as partly intimated by Mr. W. H. Dickinson, the Chairman of the Water Committee, who, in speaking after Mr. Stuart, declared the Commission to be "absolutely useless," and to be "standing between London and the solution of the "water question." In other words, the Royal Commission is a stumbling-block in the way of the County Council, or

is likely to be so. If it could be thought that the Commission would recommend the transfer of the water supply to the County Council, its utility would be recognized by Mr. Dickinson. This gentleman, however, has hope that, despite any adverse report from the Royal Commission, the agitation for the purchase of the undertakings would still go on. Possibly it would. Yet the agitation is not very visible; and, so far as it exists, it may not be founded on any decided predilection for the Council as the best of masters. Purchase might see the undertakings transferred to a Water Board. Concerning the present crisis, the apprehensions of the Progressive party find yet stronger expression than in the words of Mr. Stuart and Mr. Dickinson. In the columns of "London," there is a despairing forecast, for which the reason given is that the Commissioners have a leaning in favour of the Companies, and a prejudice against the Council. What is called "the very sharp and "unnecessarily harsh treatment" of the County Council witnesses, is put in contrast with a sympathetic tone said to be adopted towards the other side. We should regret if the Commissioners appeared to be actuated by any bias on a question which pre-eminently demands calm and judicial investigation; and we cannot suppose that there is any prejudice one way, or undue sympathy the other. But the Commissioners need be guarded against so much as the bare appearance of entertaining a foregone conclusion. Anything that can be cited as indicating such a failure of judgment will be immediately fastened upon, and will be used to the disparagement of any decision arrived at by the Commission contrary to plans entertained by the Council. There can be no doubt that the case of the Council before the Commission is breaking down; and in fear of what the report of the Commission may say, there is already an attempt to discount its effect. The Companies have survived many Committees and Commissions. Will they survive this? Perhaps the Council would rather they did, if the alternative is to consist in the creation of a rival power. Even an "agitation" is worth something, and offers a useful cry at elections, or is thought to do so.

Another Acetylene Company.—A company has just been formed at Breslau to be known as the Hera International Gesellschaft für Acetylen-beleuchtung (Abtheilung Schlesien).

Natural Gas at Waldron.—In the "JOURNAL" for Dec. 28 last we called attention to the existence of a spring of natural gas which had been discovered by Mr. Charles Dawson, F.G.S., quite close to the Heathfield Station of the Tunbridge Wells to Eastbourne Railway. The spring is attracting considerable attention, and arrangements have been made by which a special train will run on Saturday, June 11, to convey members of the Brighton and Sussex Natural History and Philosophical Society, and others interested in the subject, on a visit to the spot, when the gas will be shown both in its natural state and as applied to various gas-burners. On the previous Wednesday, Mr. Dawson will read a paper on "The Natural Gas of Waldron," at a meeting of the Geological Society at Burlington House.

The Sulphate of Ammonia Committee.—The gradual decline in the value of sulphate of ammonia since the beginning of February last may have a dispiriting influence on some of the subscribers to the Sulphate of Ammonia Committee; but a little reflection will show them that they must not be too impatient for the fruits of the labours of that body. In an article published in the "JOURNAL" early in the year, we gave some indication of the immense amount of preliminary work which had to be accomplished before active operations could be commenced, and which caused the measures that have been taken by the Committee to spread information as to the value of sulphate of ammonia to be somewhat late for the present agricultural season. But apart from this, some few months must elapse before the full effect of the Committee's work can be felt. For instance, agriculturists who have not hitherto had experience with sulphate of ammonia are not likely to immediately take for granted all the good things that are said about this article, as a manuring agent, in the pamphlets that are distributed by the Committee; and not until they have experimented with it on a small scale on their own account, will they commit themselves to its use in a large way. Then others will no doubt wait until they see the results of the crops which are to be grown in the competition for the prizes offered by the Committee to District Agricultural Societies; and these results cannot certainly be known before the autumn of this year. With regard to the competition for the substantial prize of £500, which the Committee have decided to offer for an essay on sulphate of ammonia, we learn that the matter is engaging their earnest attention. The judges and referee have been selected, and have accepted the invitation to act in those capacities; and shortly we may expect to hear something as to the conditions which will be attached to the competition. We also understand that a meeting of the subscribers will be held in July.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1087.)

THE week just closed on the Stock Exchange (a short one, by the way, for the annual May holiday fell on Monday) was not remarkable in any respect. It opened with a great flourish, but soon sustained a check; and thenceforward to the end of it business ruled decidedly quiet. The attitude was one of expectation, waiting for particulars of the Manila engagement which did not arrive. Subject to some fluctuations, the prevailing tendency was favourable; Americans naturally taking the lead. Consols fell perceptibly, owing to the movements of the Money Market. In this market there was considerable ease in the earlier portion of the week; but the transfer of the Chinese indemnity on Saturday, and the consequent lock-up for a period, hardened the market. Business in the Gas Market was not very brisk; the whole volume of transactions being decidedly below what one might look for at this time. Movements in value are few and irregular. Of those which are in the downward direction, the greater proportion were the setting-back of some stocks which had been left standing in advance of similar stocks of the same undertaking. Of those which moved upward, Gaslight "A" was conspicuous for a very quick recovery of the two points lost in the previous week. It was a little uncertain at first, dropping to 282 on Tuesday. But it then pulled itself together; and the closing mark was 286—the best of the week. The secured issues were rather inactive; but they held their places. South Metropolitan was steady, and without variation—changing hands every day at something like 134. The quotation of Commercial old was corrected to 328, which puts it abreast of the new; and one or two transactions were done at corresponding figures. Business in the Suburban and Provincial Companies was of the mildest description; and the only move was the dressing-back of Brentford new into line with the old stock. The Continental Companies were not busier than the rest. Here movements were very irregular; for Imperial cheered up at the report of the Directors, but Union preference was depressed, while European remained unmoved. Among the rest, River Plate had a little advance. Business in Water was rather better at first; but then it died away. Prices were hardly changed; only sellers of Southwark and Vauxhall debentures made their price lower.

The daily operations were: The Gas Market reopened on Tuesday with a little animation; and prices on the whole were very fair. Imperial Continental rose 1. On Wednesday, transactions were scarcely so brisk; but prices were still as good. Imperial Continental gained 1; but Brentford new fell 5½. Thursday's volume of business was about equal; but movements were various. Gaslight "A" advanced 2; and River Plate, ¼. But Brentford new receded 2½; and Continental Union preference, 5. Friday was a quiet day and uneventful; no changes being made. Saturday was much the same; but in Southwark Water, the 4 per cent. debenture stock fell 1.

ELECTRIC LIGHTING MEMORANDA.

Apology to Mr. F. H. Medhurst.

IN our issue of the 3rd inst., under the heading of "Electric Lighting Memoranda," we commented upon electric lighting matters in Hackney and Fulham, and incidentally referred to Mr. F. H. Medhurst's schemes in connection with these two Vestries as involving a combination such as "never lived except in dreams, nor shone—except on paper." We have since ascertained, however, that the combined schemes which Mr. Medhurst submitted and recommended to both the Hackney and the Fulham Vestries, are on the lines of the best modern practice, inasmuch as precisely similar combined schemes have been adopted, and are working satisfactorily, in Shoreditch and at Oldham. We, therefore, offer Mr. Medhurst our sincere apologies for the manner in which we referred to him and to the schemes recommended by him in the "Memoranda" in question.

Proceedings of the Joint Committee on Electricity Supply from Large Stations—The Legal Obstacles—The Practical Difficulties—The Compulsory Purchase of Sites—Municipal and Scientific Objections.

THE interest of last week in regard to matters electrical centres in the proceedings of the Joint Committee of Lords and Commons appointed to consider the general question of the grant of further statutory facilities for the establishment of generating stations. As a preliminary to the parliamentary inquiry, a conference of representatives of municipal authorities was held under the auspices of the Municipal Electrical Association. Local authorities are very reasonably exercised in mind over the latest phase of the development of electricity supply for the purposes of distributing light, heat, and power, in which the central station of established practice becomes the outlying electricity factory. It is to the credit of the delegates to the conference that they made no difficulty over accepting the

principle of the new departure; but they decided that the consent of the local authorities should be obtained to the compulsory acquisition of lands for the generating stations, and also to the grant of power to break up streets between the station and the boundary of the area of supply. The condition proposed is not at all likely to be granted, if it means that the local authority would have the power to veto a scheme of the kind—"local authority" being merely another name sometimes for the landowning interest. The reference submitted to the Committee is regarded as of great importance. The first witness heard was Sir Courtenay Boyle, who put the Committee in possession of the state of the law of electricity supply, and stated generally the principles on which the Board of Trade proceed in dealing with Provisional Orders under the Electric Lighting Acts.

At present, there is no power vested in the Board of Trade to authorize the purchase of land for electric lighting stations otherwise than by agreement. In this respect, Provisional Orders under the Electric Lighting Acts are like Provisional Orders under the Gas and Water Works Facilities Act. There is, under the former Acts, no requirement for notice to be given to the owners of surrounding property of what is proposed to be done with the land that might be acquired by agreement; and this has proved a grievance. The new scheme of development of electricity supply, as mooted in the General Power Distributing Company's Bill, has raised many questions of policy with which the Board of Trade are not competent to deal. Sir Courtenay Boyle told the Committee what these are, and warned them that several of the points of the reference are of a highly debateable character. The principal difficulties are both of law and of practical working. Under the Electric Lighting Acts, local authorities are enabled to acquire the electric lighting undertaking within their own district at the end of 42 years from the grant of the Provisional Order. But the Acts make no provision for the case of undertakings of the kind in which more than one local authority is interested. Sir Courtenay Boyle sees no way out of the difficulty which would arise when the time came to purchase, and one local authority had the mains and another the generating station, but for the former to contract with the latter for the supply of energy or lay down works of their own. His present opinion is against giving one local authority power to compulsorily purchase a generating station outside their own area; he would rather leave the two authorities to bargain or combine. But suppose they cannot agree to do either?

Then as regards the practical question, this relates chiefly to the matter of voltage of the transmitted current. Sir Courtenay Boyle, reminiscent of many wrangles on the point, told the Committee they "would no doubt have before them expert witnesses who would say that it was just as easy to convey electrical energy safely at a very high pressure as at a low pressure; while others would say that electrical energy was like a wild beast in a cage, always trying to escape, and the larger it was the more it would try to get out." This prophecy, like most others relating to electricity supply, was not fulfilled. Nobody tried to frighten the Committee with the "wild beast" analogy; opposition to the general principle of large generating stations, on the score of danger, being so slight as to be negligible.

Plenty of evidence was laid before the Committee as to the disadvantage under which existing territorial electricity supply undertakings labour by reason of their having no power to compulsorily acquire the land needed for their works extensions. Some of the London establishments are in a trap, from which they can only be delivered by having an alternative source of supply in bulk. It has always struck us as a weak place in the case for the electrical distribution of power in large amounts, that the Metropolitan Electric Lighting Companies, with one solitary exception that proves the rule, have preferred to locate their generating stations as centrally as possible within the area in which they do business. They have not been solicitous to acquire waterside sites. Now, however, this criticism is about to be met. Dr. Kennedy is the engineer of a scheme for supplying Metropolitan undertakers only in bulk, from an outside generating station. Mr. James Swinburne also testified that the time for long-distance transmission of electrical energy has come; and he claimed that the legal and administrative obstacles to the development of the system for the public advantage should be abolished. Of course, this witness and those who were with him strongly objected to the suggestion that local authorities should have the power of vetoing such schemes.

The municipal aspect of the question was expounded to the Committee by Alderman Higginbottom, Chairman of the Electricity Committee of the Manchester Corporation. Very unfortunately, the Manchester view seemed to be that nobody besides the Corporation had any business to touch electricity generation, either in the city or within a vague, but extensive, "sphere of influence" surrounding it. This municipalization of the idea of the "hinterland" which the country has heard so much about in foreign politics, was received somewhat impatiently by the Committee. Dr. John Hopkinson criticized the large generating station projects with considerable point and force. When asked whether he thought the huge works of the kind abroad have in them the elements of success, the most he would say even of the Niagara undertaking was that it was "probable;" but they had had to pay heavily for a good deal of their experience. He did not think there was much advantage in locating a generating station near the coal supply, "because coal can be carried so very cheaply." With regard to the suggested case of a large area, like the Midland Counties, Dr. Hopkinson would have many generating stations, rather than a single one. He would not even group a few of the neighbourly Lancashire towns together for the purpose of electricity supply. London should have two or three outside generating stations in convenient situations. Witness summed up the case by observing that this question is one of a balancing of advantages, in which the balance would be likely to go against the huge generating station for a large district.

THE NEW BURNER OF THE WELSBACH COMPANY.

Last week we gave a special account of the new Welsbach gas-burner, now being exhibited to gas engineers and others interested in the subject of artificial lighting, at the "Niagara Hall," Westminster. It was explained that this is the great novelty in incandescent gas lighting which was spoken of by Sir Henry Burdett, the Chairman of the Welsbach Incandescent Gaslight Company, in the course of his official address to the shareholders of the Company at the last ordinary general meeting in March. Thanks to the courtesy of Mr. Julius Moeller and Mr. de Fonblanque, we were enabled in our last issue to give readers of the "Journal" the earliest authentic information respecting the character of the new burner; and it is to be hoped that all gas engineers who can by any means manage to make the pilgrimage to Westminster will take the present opportunity of inspecting the Company's new speciality for themselves. We can engage that they will not think the journey wasted.

When the startling announcement to which we have referred was made by Sir Henry Burdett, the impression conveyed by it to those who have followed the development of incandescent gas lighting was vague. Everybody has naturally been asking "What next?" in regard to this system. Incessant attempts have been made for years to radically improve the incandescent gas-burner in one way or another. Some—indeed, the great majority—of these endeavours have been concerned with the material, or the construction, or the shape of the mantle. Others have dealt with the atmospheric burner. We are not now speaking of what may be called the subsidiary elements of the system of gas-lighting by incandescence—the fixing or suspension of the mantle, or minor things of that sort; but of the fundamental factors of the system. All the world knows what difficulty the Welsbach proprietary has had to preserve its rights in the incandescing body. So much attention has been concentrated on the mantle, that for a time the important part played by the atmospheric burner in the production of the lighting effect was generally overlooked. Mr. Frank Livesey was among the first to publish the fact that a good deal of the success of the incandescent burner depends upon the air and gas being properly mixed before combustion. Several improvements of the atmospheric burner, designed to effect this purpose, were brought forward; the technical reader hardly needing to be reminded of the recent work of both Denayrouze and Bandsept in this connection.

When therefore the announcement was made that the Welsbach Company were going to put upon the market an improved burner, in which the efficiency of the gas consumed would be raised to something like 30 candles per cubic foot—which duty would be constant with all rates of gas consumption—the technical world was agog to know how it was to be done. Moreover, Sir Henry Burdett's words in imparting the information generally were open to misconstruction. He was understood by many to imply that these different rates of consumption might be secured by one and the same burner—that is to say, that the new incandescent burner might be turned up or down in use. This mistake considerably increased the mystification that resulted from the announcement of the new departure; and it is only now that the puzzle is seen to have no existence. As a matter of fact, the new Welsbach light is the same as the old—with a difference. It is very like the old in shape; only the mantle is shorter, and the incandescent body appears more compact. The burner is not made to turn up and down, which would be a doubtful advantage; but it is to be sent out in standard sizes—beginning with 1 cubic foot hourly consumption, and progressing through 2, 4, and 6 cubic feet sizes. For all these burners, the average duty of the gas will be the same; it will range from 25 to 30 candles per cubic foot. The chimney is dispensed with, and the flash-light rendered unnecessary. Mr. Moeller—and in this view he will be supported by most of our practical readers—sets less store upon the rendering of the last candle or two of illuminating power from the gas consumed than upon the other working advantages of the new burner, some of which we have named. It is a better burner all round. So long as the gas pressure does not fall below 6-10ths, the burner cannot fail with the most ordinary care to give satisfaction. In the consumer's interest a governor is desirable when the pressure is likely to be high; but a considerable excess of pressure will not interfere with the operation of the burner. At "Niagara" a burner is shown working perfectly with a blast, when the illuminating effect is comparable only to that of the electric arc. Draughts of air will not destroy the usefulness of the burner, as they do when chimneys are involved. At last the householder and shopkeeper are able to indulge in the economy and brilliancy of atmospheric gas lighting

with reasonable approximation to the serviceableness of the open flat-flame burner.

The secret of this advance is to be found in the atmospheric burner. It is wonderful, after all that has been done and said about the construction and operation of the atmospheric gas-burner, that it should have been left to M. Ottmar Kern, a French engineer, at this time of day, to make a burner of this kind better adapted than any that has preceded it to develop the lighting power of Welsbach mantles. Yet so it is; and M. Kern's patents—an abstract of the first of which we publish in another column—have been acquired by the Welsbach Company. One would have thought on general principles that what this vast industrial organization—with so many experts at command, and so much at stake on the issue of being first and foremost in the industry—did not know about the atmospheric burner could not be worth knowing. Yet here again the unexpected has happened, and the obscure Individual has justified himself in the face of all the forces of capital, organization, and trade routine. After so heartening an example, who need despair of gleaning over well-swept fields?

It is obviously the prime requisite of the incandescent gas lighting system that the mantle should be made as hot as possible, over the greatest possible part of its superficies, beginning at the bottom. If we refer to Professor V. B. Lewes's Gas Institute lecture last year, as giving the best information available respecting the atmospheric burner, the first thing that strikes one is the statement that "this form of burner, in one or other of its modifications, is the one most commonly used for incandescent lighting; and the method by which the mixture of air with the gas before combustion is brought about *is simplicity itself*." The italics are ours. They mark a "fatal facility" in atmospheric burner construction which has operated to mask the presence in this method of burning coal gas of principles which Professor Lewes himself but partially perceived, and which for the present purpose we will credit M. Kern with being the first to follow up with special regard to the requirements of incandescent gas lighting. Professor Lewes remarked upon the performance of atmospheric gas-burners of the common laboratory or gas-stove types. He also showed, from Professor Smithells, that the hottest part of a bunsen flame when burning with the green inner zone indicative of a high proportion of air in the mixture is the outside of it. He furthermore made the curious observation that the combustible mixture which is burning here contains "less than 20 per cent. of combustible gas."* It cannot, therefore, need much more oxygen to burn it. The lecturer observed that for incandescent lighting the combustible mixture should have the maximum of air in it; and he described how this condition was fulfilled in the case of several special atmospheric burners mentioned.

Now we come to M. Kern, whose designs were "on the knees of the gods" when Professor Lewes lectured. He proposed to go to the extreme of possibility in adding air to gas—even to the bounds imposed by explosion; and he declared his object of "constructing a burner in which the admission of air to the gas is so adjusted that, in the mixture obtained, the amounts of oxygen and hydrocarbon gas are, practically, in the proportion of the chemical equivalents of these two gases. Thereby the mixture becomes self-burning—that is to say, it will burn in a closed chamber from which the external air is excluded." This object recalls what has just been noted, of the little air required to complete the process of combustion in the hot outer skin of an atmospheric gas-flame with plenty of air in it. The next question is concerned with the prevention of explosion in the combustion of this mixture—that is, of its firing-back. M. Kern sets himself to solve this practical problem in a workmanlike manner. He begins with the injector form of gas-inlet; and to this he adds the well-known Venturi double-cone pipe. This consists of a short lower cone, joined at its frustum into the frustum of a superior longer cone. He calls the lower the mixing cone, and the upper the suction cone, "since its function is to accelerate the issue of the mixture at a narrow section." This phenomenon, of the action of conical pipes upon gases in motion within them, is one of those physical surprises which the designers of early atmospheric burners had no reason to search out. Something more, however, is required to enable an almost explosive mixture of gas and air to burn quietly at the end of a Venturi pipe. This is a matter of wire-gauze—the familiar Davy safety device; and, lest the flame should be put out, there is a means of warming the poor mixture by conducted heat from the central part of the flame. This recalls the late Sir William Siemens's idea of increasing the luminosity of a gas-flame, realized in a burner exhibited at the Birmingham meeting of The Gas Institute, in 1881, although the application is quite different.

To cut it short, M. Kern's object is to keep the incandescent mantle at or about the hottest part of the atmospheric gas-flame, which, as Professor Smithells has demonstrated, is ordinarily in the outside sheath. By reason of the peculiar character of the gas mixture he employs, he claims that this maximum temperature is realized in a "hyperincandescent zone" of dimensions sufficient to embrace a mantle. For the production of this, moreover, an additional supply of air from without at the point of combustion is not needed. That is to say, the atmospheric burner is self-contained. As the result, the mantle which is exposed to the heat of the "hyperincandescent zone or flame" will be raised to a much higher degree of incandescence than it could attain under other conditions, and will yield a correspondingly more brilliant light. This is the fact. There is no supposition about it. We may not, and do not at present know what the quality of hyperincandescence means when translated into degrees of temperature. M. Kern does not say anything about that. It is probable, however, that a slight increase of temperature at the high regions at which an incandescent gas-burner works has a great effect upon the luminosity of the solid body. It is certain that any cooling agency—such as the presence of a metallic rod inside the mantle, for holding it in position—exerts an apparently disproportionate deteriorating effect upon the illuminating power. The contrary may, therefore, be presumed to obtain in the case in point.

There is no mystery or trickery about the latest improvement of the incandescent gas-burner at the hands of M. Kern, aided, of course, by the experience and resources of Mr. Moeller and his staff. He discloses in his patent specifications what his object is, and describes his method of attaining it. The result is incontestable, as any visitor to "Niagara" can see for himself. At the same time and place there are to be seen sundry other interesting indications that the growing future of gas lighting is being well provided for by the Company; not the least being Sheldrake's cast-metal street-lantern, which is calculated to reduce one of the most irksome of the troubles of the gas distributing engineer.

* See "JOURNAL," Vol. LXIX., p. 1413.

THE PRODUCTION AND CONSUMPTION OF CYANIDES.

THE consumption of immense quantities of alkaline cyanides in the gold recovery works in South Africa and other gold-producing districts in recent years, has turned the attention of the gas manager to the modern processes of gold recovery. For years he has had to maintain an intelligent interest in the value and application of manures from various sources, in order to follow, and if possible foreshadow, the fortunes of sulphate of ammonia; now he has similarly to watch the progress of the various methods of gold recovery, in order to anticipate the probable demand for cyanides. About five years ago, this sufficed to put him in a position to judge the extent to which the extraction of cyanides from the coal gas would be advantageous to his works. Now he has, in addition, to keep a sharp eye on numerous systems for the production of cyanides from atmospheric nitrogen and ammonia; for several of these processes have lately become commercially successful, and he no longer has a monopoly of suitable raw material for the manufacture of cyanides on a large scale. During the last two years or so, the rivalry of various producers of cyanide has culminated in the end which all new chemical industries now seem fated to attain very rapidly—viz., over-production. The stage in which free competition will decide which of the too numerous processes is best adapted to survive, has already been entered upon; and many gas engineers are of opinion that the production of cyanides from coal gas will be superseded by some of the new synthetical methods of manufacture. Certainly the synthetical methods offer many advantages, of which perhaps the chief is the relative ease with which they afford pure products. In coal gas, however, the cyanogen molecule exists; and its formation has entailed no special expenditure. The problems of extraction and conversion to marketable products alone have to be faced. The initial difficulty of uniting carbon and nitrogen into cyanogen, has been overcome in the retort and hydraulic main; and in this respect, the gas manager has, in common with the superintendent of other works where coal is subjected to destructive distillation, an advantage over all other producers of cyanides. He merely separates the cyanogen in a convenient form from the heterogeneous mixture in which he finds it, and then converts it to a suitable compound for sale.

The extent and virulence of the competition which the gas manager has nevertheless to face, are well indicated by the fact that a process for the production of cyanide in the electrical furnace is about to be used in Scotland; and Professor Ramsay is stated to have reported that the cost of potassium cyanide made by this method should be only 5d. per lb. The process is the invention of Dr. J. B. Readman, of Edinburgh, and is protected under Letters Patent No. 6621 of 1894. According to the specification, the oxide or carbonate of one of the metals of the alkalies or alkaline earths is well mixed with about one-fifth part of its weight of charcoal, and passed into a carbon-lined electrical furnace into which nitrogen is led. The cyanide formed is run off through a tapping outlet into a vessel protected from the air; and any cyanide which volatilizes and passes off with the exit gases, is recovered from the latter. This process thus appears to be a simple synthesis of cyanide from carbon and nitrogen, in the presence of whatever base is required in the commercial product. Potassium cyanide has hitherto been most largely used in the goldfields, though sodium cyanide has also been employed, and has the distinct advantage of containing a higher percentage of cyanogen. Whichever cyanide is needed, it can be produced by Dr. Readman's process directly from its component elements. As to the expenditure of electrical energy in its production, we may take it from Professor Ramsay's

estimate of the total cost of manufacture, that it is very low indeed, though, of course, nitrogen or deoxygenized air and charcoal or coke are cheap. The cost of the base will be the same in all methods of manufacture. There is, however, said to be an economy in the production of cyanide by synthesis, when the barium compound is made in place of the cyanide of potassium or sodium. The precise course of the synthesis of cyanide from nitrogen, carbon, and a base is not yet known with certainty; but the readiness with which barium cyanide is formed, favours the view that a carbide of the metal is produced as an intermediate compound. Whatever be the theory of the synthetical process, the results which it is said to yield threaten to soon drive all other methods of producing cyanides from the field.

There is another class of synthetical processes for the manufacture of cyanides, to which several commercially successful schemes belong. These systems take the nitrogen of ammonia, instead of free nitrogen, as the source of the nitrogen of the cyanogen molecule. It appears to be fairly universally conceded that the production of cyanide from ammonia is most readily and economically carried out through the intermediate formation of sulphocyanide. Ammonia interacts with carbon bisulphide, and yields ammonium sulphocyanide and ammonium sulphide. If hydrated lime be present, calcium sulphocyanide is obtained, and the pressure of the reacting gases is considerably reduced. Under carefully regulated conditions of temperature, the yield of sulphocyanide will be almost precisely that indicated in the following equation, in which intermediate products are passed over for the sake of showing simply the ultimate course of the reaction. It is essential that ammonia be present in excess of the quantity shown in the equation.

$$6NH_3 + 2CS_2 + Ca(OH)_2 =$$
(102 parts ammonia) + (152 parts carbon bisulphide) + (74 parts hydrated lime)

$$Ca(CNS)_2 + 2(NH_4)_2S + 2H_2O$$
(156 parts calcium sulphocyanide) + (136 parts ammonium sulphide) + (36 parts water)

The ammonia of the ammonium sulphide is easily recoverable; and thus it is clear that the 156 parts of calcium sulphocyanide can be obtained from an actual expenditure of only 34 parts of ammonia. According to some processes, iron or manganese (in the form of Weldon Mud) is introduced to take up the sulphuretted hydrogen; but the use of these materials appears to be unnecessary, provided proper conditions of temperature and proportions of ingredients be observed.

The next step is the conversion of the calcium sulphocyanide to cyanide; and for years manufacturers have failed to achieve this with economy. Recently, however, some promising processes have been devised. The methods in which sulphocyanide is fused with iron or zinc in a reducing atmosphere, give fairly good yields of cyanide, with sulphide of iron or zinc as a bye-product. There are many difficulties in these methods, however, and several attempts have lately been made to effect the conversion in the wet way. A temperature of 285° to 300° Fahr., or a pressure of 45 to 50 lbs. of steam, effects conversion in a closed vessel. The calcium sulphocyanide obtained by the method already described, or by other commercial processes, is mixed with concentrated solution of ferrous chloride and some finely-divided iron, preferably obtained by reduction of the oxide. The reaction appears to take place as follows:—

$$Ca(CNS)_2 + FeCl_2 + 2Fe =$$
(156 parts calcium sulphocyanide) + (127 parts ferrous chloride) + (112 parts iron)

$$Fe(CN)_2 + 2FeS + CaCl_2$$
(108 parts ferrous ferrocyanide) + (176 parts ferrous sulphide) + (111 parts calcium chloride)

The ferrous ferrocyanide and ferrous sulphide form a black precipitate; while the calcium chloride goes into solution. The precipitate is attacked by caustic alkalies, and yields a soluble alkaline ferrocyanide and insoluble sulphide of iron. There is, however, a considerable loss of alkali, which forms an insoluble compound with the sulphide of iron. The loss is said to amount to 22 per cent. of the alkali when caustic soda is used. By filtration from solid matter, a solution is, however, thus obtained, which gives crystals of sodium ferrocyanide. The sodium ferrocyanide is dehydrated by heating, and converted to cyanide by smelting with metallic sodium, or by some other of the numerous methods for the conversion of ferrocyanides to cyanides. The recent fatality at the Beckton Chemical Works (*ante*, p. 80) appears to have occurred while converting potassium ferrocyanide to cyanide by means of metallic sodium.

The foregoing sketch of the process by which the cyanide of one of the alkalies may be produced from ammonia and carbon bisulphide, is taken chiefly from papers by Mr. J. T. Conroy, of the United Alkali Company, Limited, of Widnes, and published recently in the "Journal of the Society of Chemical Industry." Modifications of nearly every step in the process have been tried; and these have been the subjects of numerous applications for Letters Patent. The exposition we have given shows, however, the chief stages in a typical process. On the face of it, it scarcely seems probable that any method of producing cyanide from ammonia can compete with Dr. Readman's synthetical process, if the estimated cost of production by the latter be substantiated in practical working.

The processes by which potassium or sodium cyanide may be produced from the cyanogen of coal gas, nearly all aim at the production of ferrocyanide without the intermediate formation of sulphocyanide. The conversion of ferrocyanide to cyanide takes place as already described; and therefore the cost at which the ferrocyanide can be produced will show at a glance whether the manufacture of cyanide from ammonia and carbon bisulphide will render the manufacture of it on a gas-works unremunerative. For the production of ferrocyanide from the cyanogen of coal gas, the only raw materials absolutely necessary are some suitable compound of iron, and the alkali or base of the ferrocyanide which is the final product. In the synthetical process, ammonia and carbon bisulphide are also required. Therefore, as already indicated, the gas-works effects a saving in the cost of raw material. On the other hand, a very large volume of gas has to be dealt with for a very small yield of ferrocyanide; and the gas contains compounds which interfere with the activity of the materials used for abstracting the cyanogen. On a practical scale, 1000 cubic feet of gas from Durham coal will yield only about 0·10 lb. of potassium ferrocyanide; and therefore about 10,000 cubic feet of gas have to be handled for the production of 1 lb. of that product. If the cyanogen in the gas is abstracted in the ordinary washer-scrubber, by the addition of some iron salt to the liquor therein, there is no extra outlay on plant for handling the gas; but the sulphuretted hydrogen in the gas and liquor causes the formation of ferrous sulphide, and to a certain extent renders the iron salt inert. Moreover, the ferrocyanide thus obtained in the liquor is associated with such a number of ammonium compounds that its separation in a state of purity is a very difficult task. The ferrous sulphide which settles from the liquor also has some cyanogen compound associated with it. Probably this compound is the ferrous ferrocyanide referred to in connection with the synthetical process of production from ammonia and carbon bisulphide. Notwithstanding the complexity of the liquor obtained by the simple addition of a solution of an iron salt to the washer-scrubbers, the recovery of its ammonia and cyanogen has been for some years carried out with some measure of success in London works. By one method, the ferrocyanide in the liquor is converted to prussian blue, and thence potassium or sodium ferrocyanide is obtained. It is a curious fact that the ferrocyanide in the liquor from the washer-scrubber slowly passes out of solution, and appears converted into the insoluble compound of iron already referred to.

A method which is used in many gas-works in the North is that protected by Mr. William Foulis, under Letters Patent No. 9474 of 1892,* with the modifications protected by Messrs. Foulis and Holmes, under Letters Patent No. 15,168 of 1895.† The salient features of this system are that the gas is washed and scrubbed in the ordinary way before it is treated for the extraction of cyanides, and that the absorbing agent used is a solution of alkaline carbonate containing carbonate of iron in suspension. Therefore the nature of the ammoniacal liquor made is in no way interfered with; and the alkaline ferrocyanide which is produced in the absorbent is relatively free from contamination. On the other hand, a specially prepared carbonate or oxide of iron, and alkali are required; but since iron and alkali must be introduced at some stage in the manufacture of alkaline ferrocyanide by any process, there appears to be little or no loss of economy by adopting the special absorbent in place of other preparations. The only point in which the method really compares unfavourably with the process in which an iron salt is introduced into the ordinary washer-scrubber, is that a special washer-scrubber or similar apparatus is necessary for treating the gas with the absorbent. Some additional capital outlay is thus required; and there is the continual expenditure of power in driving the apparatus, or in forcing the gas through it. These items lay quite an appreciable burden on the system, though the relatively high degree of purity of the crude ferrocyanide obtained probably more than counterbalances it. The absorbent, when it has taken up its complement of cyanogen from the gas, is evaporated to a cake which is then extracted with water; and the alkaline ferrocyanide is obtained from the extract by crystallization. No such simple process of extracting the ferrocyanide is possible if the cyanogen of the gas is absorbed in the ordinary washer-scrubber. On the other hand, a certain percentage of the cyanogen is said to be lost owing to its absorption by iron being deferred until after the ammonia has been removed from the gas. The ammonia carries with it into the ordinary liquor a proportion of the cyanogen of the crude gas, and it appears in the liquor chiefly as sulphocyanide. When an iron salt is introduced into the ordinary washer-scrubber, less sulphocyanide will be found in the liquor than when the iron salt is absent.

(*To be continued.*)

Photography in Gas-Works.—Those of our readers who have visited recent exhibitions of the Royal Photographic Society in London will doubtless remember the remarkable pictures shown by Mr. Marsh of the interior of a retort-house while work was in progress. This gentleman's studies of industrial life are among the collection now on view at the Crystal Palace; and the one entitled "Charging Retorts" is perhaps the most striking subject photograph in the whole exhibition.

* "Journal," Vol. LXI., p. 830. † "Journal," Vol. LXVII., p. 229.

AN EXPERIMENT IN ARTIFICIAL MOONLIGHT.

Much interest attaches to every serious attempt to attain a familiar end by some unfamiliar way. All the requirements of civilized life are old, and most of the means by which they are met, more or less satisfactorily, are of commensurate antiquity. Inasmuch as the quantity and the quality of the appliances of civilized life and work have been continually increased and improved, in the course of time, so the demands of the users have grown and become more exacting, until modern man requires to be served a good deal better than his predecessors. To take for an example the service of artificial lighting, incandescent gas and electric lamps are hardly good enough for the present generation, whose grandfathers had to make shift with candles that needed snuffing. Apart from the consideration of the description of artificial lights used at different periods, however, there has been perfect and complete continuity in the practice of using light-sources for both indoor and outdoor illumination. The blazing pine-knot taken from the fire and used to light the way over some primeval waste, or stuck in a crevice of the rock to partially dispel the gloom of a cave, was the direct forerunner of every modern pattern of lantern and chandelier. So economical of invention have men been in their methods of lighting, that we can see around us to-day many examples of the inane imitation of candles by incandescent electric lamps. Such a confession of poverty of ideas in regard to interior lighting would reconcile an observer who wishes to entertain a good opinion of contemporary domestic arts to almost anything in this line, however *bizarre*, that could at least claim the attention due to originality.

For this reason we have already noticed briefly the experiment in lighting the Columbia University Library, of New York, on the principle of so-called "artificial moonlight," as specially worked out by Professor Hallock, upon the suggestion of Mr. M'Kim, the architect of the University building. One of our American contemporaries, "Progressive Age," was so pleased with the European comments upon what was known of this experiment from the ordinary sources of news, that with praiseworthy enterprise it secured a paper on the subject, from Professor Hallock himself, which appeared in the issue for March 1 last. This authoritative statement of the genesis and effect of the innovation in lighting practice is deserving of some study, though whether the end will be generally held to have justified the means may be doubtful. For one thing at least the experiment is to be respected—it was due to the thought bestowed by the worthy architect upon the problem of how to blend the architectural with the artificial lighting effect. Architects too rarely offer the world any evidence to show that they really care for this matter to warrant passing over without some recognition this brilliant exception.

From the description we learn that the Columbia University Library building is a square hall covered by a lofty dome. The general form of the structure recalls that of the Pantheon in Rome. Obviously, the practical problem of the artificial lighting of such an interior, with regard to architectural effect, is a difficult one. The commonplace solution would be by the local use of small lights for the reading-desks, supplemented by a ring of lights round the base of the dome itself, or outlining the transept arches, for showing the shape of the structure. If the latter part of the work were properly done, as it is, for example, in St. Paul's Cathedral, the decorative effect would be good; but the lights would not answer for lighting, properly so called. They would be a scheme of illumination, in the decorative sense of the word. Isolated light-sources, of the ordinary kind, of sufficient power to show the form of the dome, would be themselves too conspicuous for the purpose, and would attract the eye instead of enabling it to see other objects. Professor Hallock has discussed intelligently the general question of interior lighting; and what he has to say on the subject is instructive and suggestive, without reference to the particular conclusion he arrives at. He lays stress upon the desirability of diffused light for working by, as contrasted with the dazzling intensity of electric arc and naked Welsbach lights. The practical problem is to get this diffusion. He very truly remarks: "Much can and must be done to improve the character of our illumination, not so much in large halls where hundreds of lights enable a general distribution of illumination, but especially in small halls and rooms. Still I think few things are less attractive than a myriad of points of light." Then he suggests that not many people realize that a dead-white surface, such as a whitened wall or ceiling, reflects 80 per cent. of the light which falls upon it.

It is unnecessary for us here to repeat the successive steps by which Professor Hallock at length gets to the concrete example of the "artificial moon" of the Columbia University Library. "Architecture demanded a large mild source of light in the centre of the spherical dark blue dome which surmounts the large reading-room." After many suggestions and trials, the following plan has been adopted: A white opaque sphere, 7 feet in diameter, is suspended by a ¼-inch steel rope from the centre of the dome, so as to hang at the level of the string-course running round above the transept windows. "Even by day this seeming giant pearl, seen against the dark blue of the interior of the dome possesses a unique beauty." In eight equi-distant corners of the upper balcony are placed as many projecting lanterns, which throw upwards, at an angle of 35°, a disc of light 6 ft. 6 in. in diameter upon the sphere. The discs of light overlap laterally and underneath, so that the whole sphere as viewed from below seems to glow with a pale, diffused light. It must be remembered that this reflecting sphere is only intended to light the dome and the upper part of the hall. The reading-desks are supplied with shaded lights, as usual. What the sphere does, therefore, is to replace the lines of burners, or exposed lights of comparatively high intensity, by which the architectural lines would otherwise be displayed, and the building generally illuminated. This purpose is claimed to be perfectly attained. "The effect is beautiful in the extreme. The surface seems translucent, and the light appears to come from a certain depth within, and to make the whole glow with warm life; and as the ball floats below the ceiling of invisible blue, it is impossible to locate it. Whether it is a pearl near us, or a moon in the clear blue sky miles away, is left to the imagination."

Of course, this sphere is not so economical of illuminating power as the actual arc lights would be; but it has a great advantage in point of convenience for lamp-trimming. Professor Hallock gives the modest figure of 500-candle power as the useful duty of the sphere, determined by a crude test; "but the light is so white and so agreeable that it gives one the impression of greater power." Impressions of this kind are notoriously untrustworthy. The height of the dome is not stated; but it appears to be of about 75 feet diameter in the clear, and the sphere is suspended at the height of 85 feet from the floor. The author of the plan admits that the method of lighting "is unusual, and in many ways more extravagant and difficult than one often meets." Yet it is claimed to be so successful that "it would be surprising if the next ten years did not see it duplicated and improved." From the independent testimony of "Progressive Age," we learn that the arrangement is not quite so perfect as could have been wished. "Notwithstanding all precautions, a slight shadow of the globe is cast upon the dome, surrounded by a faint luminous halo; this is probably due to lateral reflection from dust particles in the air, which are sufficient at times to make the projected rays visible from below." This is just what might have been expected; and an artificial moon in a library, visibly lighted, like a "star" artiste with limelight, by beams from corner reflectors, would not leave the spectator with much illusion.

The sphere is made of a wood framework, covered with wood veneering, and carefully coated with a white matt-surface wash. It weighs about 400 lbs. We give these particulars as to the Columbia Library experiment in case any of our readers should care to repeat it for an exhibition, fancy fair, or similar entertainment, for which we cannot help thinking it would prove more suitable than for the sober use of a reading-room. There is, of course, no novelty in the principle of illuminating by reflected light from dead-white surfaces. This has often been done with a view to overcome the objectionable glare and flickering of arc lamps for interior use; but we are not aware that such attempts have been rewarded anywhere with permanent success. It is possible to cure glare in this way; but the evil of flickering cannot be so obviated. Indeed, the flickering of electric arc lamps screened from direct view in this manner has the irritating effect of a small "Northern Lights" display, which is completely subversive of that calmness which should go to comfortable reading or writing. The merit of the Columbia Library experiment consists mainly in giving a decorative value to the scheme of reflection, by substituting a sphere for the commonplace flat screen that had been employed in factory practice on the same lines. Our American contemporary ventures upon the declaration that "indications at present point toward marked development in this direction in the near future; and it might well be said that Columbia's artificial 'moon' is an epoch-maker in this branch of illumination." This is nonsense. The further suggestion is offered that "any other bright light-source, such as a cluster of incandescent gas mantles backed by a reflector, or a group of acetylene burners, might be employed; the light could be projected by a single condensing lens against a hemisphere or circle of any tint, and located in any position or being of any size. The light-sources could be located outside the place to be lighted, and thus do away with the vitiated air, excessive heating, cumbrous and expensive fixtures, and any dazzling effect on the eyes." All this is much in the air.

The experiment now in question is certainly worth noticing, for the reasons already given; but, after all, its intrinsic importance is small. It is to be welcomed rather as an example of a courageous attempt to break through the bonds of conventionality, which have proved themselves to be particularly strong in regard to this matter of the artificial lighting of interiors. The attempt has not resulted in a solid success, but merely in a tricky scenic triumph. There is, for one thing, a vast gap between the estimated illuminating capacity of the electricity used by the eight arc lamps, and the realized illuminating power of the sphere. The lamps would be credited with a nominal illuminating power of 1200 candles apiece if used in ordinary street lighting service. Taken at 500 candles actual, there are 4000 candles to be accounted for; and yet the sphere only reflects a light of 500 candles by Professor Hallock's own showing. What becomes of the unaccounted-for balance? How is so much waste to be reconciled with the statement that the reflecting power of a dead white surface is 80 per cent. of the value of the incident radiation? If anybody wants to make an

artificial moon of this pattern, would it not be more economical, and equally effective, to build one of oiled canvas and put a cluster of incandescent gas burners inside?

For all this, it is to be conceded that Mr. M'Kim, and his colleague, Professor Hallock, deserve credit for their enterprise in providing the Columbia University Library with artificial moonlight. It is very dear, it is not very bright—indeed, a full moon shining through the library windows casts the shadow of the artificial luminary against the opposite wall; but it is better than the imitation candles stuck in glorified ginger-beer bottles which have hitherto represented the highest efforts of electricians in the direction of decorative interior lighting.

OBITUARY.

Mr. D. Dewar, who was for about fifty years in the Gas Office at Perth, and who retired upon a pension a year ago, died in Newcastle-on-Tyne on Friday, the 29th ult. Mr. Dewar was a prominent city official; and he was also Secretary and Treasurer of the Scone and Perth Lodge.

Sir J. Bain, ex-Lord Provost of Glasgow, senior partner of the firm of Messrs. J. Bain and Co., Harrington Iron-Works, Cumberland, died at his residence in Glasgow on Monday, the 25th ult. He was a self-made man, but rose to be a Deputy-Lieutenant and Justice of the Peace for Lanarkshire and a Magistrate in Cumberland. He entered the Town Council of Glasgow in 1863. He and Bailie Couper initiated the proposal for the taking over of the gas undertakings in the city. He was elected Lord Provost in 1874. During his career he did much useful work for Glasgow, of which he was one of the most distinguished citizens. He was knighted in 1877.

PERSONAL.

Mr. Alfred T. Fletcher, formerly of Leigh, has obtained an appointment at Barnard Castle.

Mr. A. Cookson has been appointed Secretary and Manager of the Tarporley Gas Company, in succession to Mr. P. H. Jeffs, who has resigned.

Mr. L. Hislop, Engineer and Manager of the Bothwell and Uddingston Gas Company, has been awarded the diploma of the Royal Scottish Society of Arts and the diploma of the Chemical Society.

Mr. W. H. Hamblett, a member of the Salford Town Council, has been appointed Superintendent of the Lighting and Scavenging Department of the Corporation, who are about to have an installation of incandescent gas lighting in the principal streets of the borough.

Mr. W. Lindley Catlin has been appointed Engineer and Manager of the Faversham Water Company, in succession to Mr. Robert Darney, who has resigned after holding the position since the works were constructed in 1863. There were upwards of 30 applications for the post. Mr. Catlin was recently Clerk of Works during the carrying out of the water-works for Haverhill, Suffolk.

The Tramways Committee of the Liverpool Corporation recently came to a certain decision, with one dissentient, on the subject of the introduction of electrical power. When the matter was before the Council last Thursday some of the members of the Committee who had previously agreed with the proposal voted the other way. This proceeding has led to the Chairman of the Committee, Sir Arthur Forwood, sending in his resignation. He is now no longer an alderman of the city; and his place on the Council is vacant.

On Saturday, the 30th ult., a presentation was made by the employees of the Widnes Corporation Gas and Water Department to Mr. F. Thorpe, who is leaving to take the position of Gas Engineer to the Colne Corporation. The presentation, which consisted of a cabinet drawing-room timepiece in walnut, with gilt mountings, and bearing a suitable inscription, was made by Mr. J. Owen, the oldest employee at the works. Mr. Thorpe, in acknowledging the gift, expressed the hope that at Colne he would have as good workmen under him as he had always had at Widnes.

British Association of Water-Works Engineers.—As already announced (*ante*, p. 767), the third annual general meeting of this Association will be held at Southampton on the 24th inst. and three following days. The business will be transacted at the Hartley College, under the presidency of Mr. W. Matthews, F.G.S., M.Inst.C.E., the Water-Works Engineer to the Corporation of Southampton. The following papers will be read: "The Chemical and Bacterial Examination of Water," by Dr. Percy Frankland, F.R.S., Professor of Chemistry at Mason University College, Birmingham; "Extension of Filter-Beds, &c., Service Reservoir, and Water Tower, at Cardiff," by Mr. C. H. Priestley, Assoc.M.Inst.C.E.; "The Sources of Town Water Supplies, and their Bearings upon the Public Health," by Mr. R. E. W. Berrington, Assoc.M.Inst.C.E.; and "The Gosport Water Supply," by Mr. E. T. Hildred, Assoc.M.Inst.C.E. The afternoons of the 25th and 26th, and the whole of the 27th, will be devoted to visits to neighbouring water-works.

NOTES.

The Use of Coal Tar in Cement Manufacture.

The connection between the coal-gas industry and the manufacture of portland cement is ordinarily, in England at any rate, understood to consist in the use of gas coke as fuel for the cement-kilns. From a passage in a paper on the "History of the Portland Cement Industry in the United States," by Mr. Robert W. Lesley, it appears that this is not the only link between the two industries. The first hydraulic cement to be made in the United States was a kind of roman cement, made by calcining at a low temperature natural rock containing lime, alumina, and silica in suitable proportions. Native attempts to make portland cement like the English article did not succeed. Patents were necessary to enlist capital in the earlier enterprises of the kind. The great difficulty of these ventures was the cost of the process. About 1884 or 1885, patents were taken out by Willcox, Smedt, and Lesley for the admixture of coal tar or other liquid hydrocarbon with the cement "slurry." This resulted in a composition which when compressed into balls, could be put into the kilns at once; and thus many of the intermediate stages of the ordinary process were dispensed with, and much labour saved. These patent processes were used in the works of the American Cement Company at Egypt, Lehigh Co., Pennsylvania. It is stated that the processes answered fairly well so long as coal tar was sufficiently cheap; but with the introduction of water gas, and the consequent advance of the price of coal tar, they were abandoned, and other devices introduced. It would be interesting to know how far this employment of coal tar is justified, economically and technically; for there are times, as at present, when this bye-product of gas manufacture appears to be cheap enough for anything.

The Alleged Rusting of Iron in Limestone Concrete.

Some time ago reference was made in this column to a statement made at a meeting of the American Society of Civil Engineers, to the effect that iron or steel embedded in limestone concrete in such a way that the stone touches the metal will be liable to become seriously corroded. The statement in question was taken notice of by the "Engineering Record," which justly held that, if it were correct, the safety of many metallic structures depending for stability on the integrity of holding-down bolts and cables might be regarded as imperilled. Our contemporary has accordingly published an article summarizing the available information on this subject. In the first place, reference is made to a paper describing the restoration of the ends of the cable of the Covington and Cincinnati Suspension Bridge, by Mr. G. Bouscaren. In this case the evidence is of a negative character; the only fact ascertainable having any bearing upon the question being that where the masonry in contact with the cables was wet, the metal was found to be encased in a superficial coating of rust. On the other hand, a suspension-bridge anchorage known to have been buried in dry mortar for twenty years was found to be perfectly preserved. What was intended to be an extra measure for the preservation of the cables of the Allegheny Suspension Bridge did not answer satisfactorily. The ends of the cables were covered with canvas, the surrounding spaces filled with coal tar, and the whole encased in concrete and masonry. The heat of the summer caused the coal tar to ooze away in part into the masonry, and then, by slow condensation, the space filled up with water. This water was found to contain a good deal of sulphur and carbonic acid; and many of the cable wires were deeply pitted, while others were rusted off. The general impression among engineers asked for their opinion on the matter was that the corrosion of iron embedded in concrete, whether composed of limestone or of anything else, is mainly due, where it occurs, to damp which can only appear where the concrete is bad.

A Liquefied Air and Carbon Explosive.

The subject of the liquefaction of air has been much discussed of late in certain technical periodicals, mainly with reference to the always vexatious question of priority of method or apparatus. In a Society of Arts paper on the subject, Professor J. A. Ewing remarks that from the industrial point of view the liquefaction of air is likely to prove valuable mainly because it gives a means of separating more or less completely the oxygen of the atmosphere from its associated nitrogen. When air is liquefied, it is noticed, as Professor Dewar has remarked, that both constituents liquefy together, so that the act of becoming liquid does not contribute to separate them. But when liquid air evaporates, the nitrogen evaporates faster than the oxygen, for it boils at a temperature which is about 13° C. lower than the boiling-point of oxygen. Hence the mixture of liquefied gases becomes richer and richer in oxygen as the process of evaporation goes on. By letting a considerable part of the liquid evaporate, a liquid remainder is left which may consist largely of oxygen; and by letting this remainder evaporate, an atmosphere rich in oxygen is obtained. Professor Ewing stated that the possible applications of this oxygenated atmosphere, or of the liquid, have not yet been worked out to any extent. The most interesting use to which the liquid has yet been put upon a commercial scale is to make an explosive by mixing it with carbon. When liquid air, enriched by the evaporation of a large part of its nitrogen, is mixed with powdered charcoal, it forms an explosive comparable in its power to dynamite, which, like

dynamite, can be made to go off violently by using a detonator. The explosive is made by pouring the liquid, containing about 40 to 50 per cent. of oxygen, on fragments of wood charcoal, 2 to 4 cubic millimetres in size. These are kept from scattering under the ebullition of the liquid by mixing them into a sort of sponge with about one-third of their weight of cotton wool. The explosive thus prepared only keeps its power for a few minutes. It has been used in a practical way on a large scale in a coal mine at Penzberg, not far from Munich.

Nipher's Anemometer.

Professor Francis E. Nipher, of the Academy of Sciences of St. Louis, has devoted much attention to the construction of wind-pressure gauges. It is generally understood that there are few physical problems of greater immediate importance than that involved in the measurement of air pressures under complex conditions of motion; while few problems in the domain of physics present greater difficulties or—what is worse—uncertainty. It may be comparatively easy to obtain, under any particular set of conditions, evidences of barometric variation, by means of some indicating instrument, apparently suitable for the particular purpose. The uncertainty, however, lies in the question of how far the quantitative result is unaffected by the action of the instrument itself. Thus, the records of the pressure-plate anemometer are of little if any value in showing the distribution of wind pressure over a large building. For measuring the wind pressure at any part of a structure of considerable size, a receiver or collector is required, with a convenient gauge connected to it by a tube. It is essential that the collector should not itself give rise to compressions or rarefactions affecting the gauge. Professor Nipher's latest instrument intended to fulfil these conditions is claimed to have satisfied some crucial tests. It consists of two equal thin metal discs, 2½ inches in diameter, with bevelled rims, which are screwed together so as to leave a small space between them into which a connecting-tube is passed through the centre of one of the discs. The end of the tube is flush with the inside surface of the disc; and the inner space is filled up by layers of fine wire screen, which project at least half an inch beyond the edge of the metal discs. When this simple device is placed in a stream of air, it is found that the effects of rarefaction and compression set up at different parts of the porous screen, completely neutralize each other, so that the pressure at the mouth of the tube is truly that of the external air. The instrument was calibrated by exposing it from a railway carriage moving at known velocities. At the same time, the pressure of the wind on a pressure-board 4 feet by 3 feet carried on the same train was recorded. The results of these and other tests are being worked out. At present it is too early to estimate the full importance of these researches as a contribution to the study of anemometry; but the idea is full of promise, and the simplicity of the apparatus is greatly in its favour.

TECHNICAL RECORD.

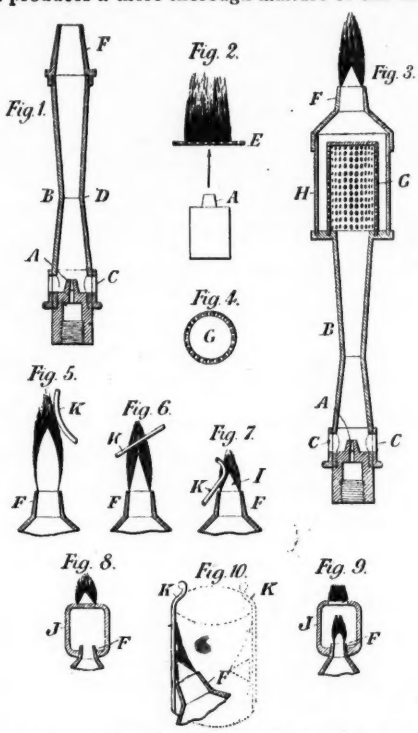
KERN'S INCANDESCENT GAS-BURNER.

Since January of last year, there has been deposited in the Patent Office the provisional specification of an invention by M. Ottmar Kern, of Paris, for "Improvements in Incandescent Gas-Burners;" and this has been followed by two other patents, taken out by the same inventor on Nov. 9 and Dec. 30. These (as stated in our article last week on "The New Welsbach Burner") are the property of the Welsbach Incandescent Light Company; and burners constructed under the patents have attracted much attention at the Niagara Hall Exhibition.

The complete specification of the first patent—filed as far back as May 25 last year, but only accepted by the Patent Office authorities on the 3rd ult.—is the only one yet available for detailed description; and in view of the interest attaching to the subject at the present time, we propose giving a full abstract of the document, with a reproduction of the illustrations by which it is accompanied. It is, however, as well to notice the fact that the burners to be described are not exactly like those shown at Westminster, and to which further allusion is made elsewhere to-day (p. 1057).

The patentee commences by saying that his invention has reference to "improvements in incandescent gas-burners of the kind which originally became known as the Clamond incandescent gas-burners, and which later have been variously improved by numerous inventors, and particularly by Auer von Welsbach." The object he sought to attain was to produce a burner that would "raise the refractory mantle or hood to a higher degree of incandescence than has heretofore been accomplished with the same amount of illuminating gas, and at the ordinary pressures at which gas is usually supplied, and this without the use of an artificial draught, such as is ordinarily produced by glass chimneys, and sometimes by mechanical blowers." This object is realized by constructing a burner in which the admission of air to the gas is so adjusted that, in the mixture obtained, the amounts of oxygen and hydrocarbon gas are, practically, in the proportion of the chemical equivalents of these two gases. The mixture thus becomes self-burning—that is to say, it will burn in a closed chamber from which the external air is excluded. This self-burning mixture is caused to issue from the burner-tip under greater pressure than with an ordinary bunsen burner of the gas-distributing system, and with greater speed than that with which the flame can propagate itself through the mixture. In this way, the flame is prevented from burning backwards, and is steadily maintained above the exit-opening of the burner-tip. Within the flame there is a zone of superior incandescence, called by the patentee the "hyperincandescent zone," and which is very much hotter than the rest of the flame. The burner is so arranged that the refractory filament, or mantle of filaments, is exceedingly close to or immersed in this hyperincandescent zone, whereby it also becomes hyperincandescent, and "thus furnishes, with the same consumption of gas, a more intense light, or the same amount of light, with a less consumption of gas."

In fig. 1 is shown a burner of the bunsen type, modified in accordance with Kern's invention in one particular respect. There is the ordinary gas-inlet with its nozzle A screwed into the bunsen pipe B as usual. The pipe has the customary air-ports C, and the throttle-ring whereby the admission of air can be regulated at will. The distinguishing feature of the pipe B is that it is formed to present two cone frusta, joined at their smaller ends at D; the lower cone frustum being shorter than the upper one. Such a pipe, but with its parts differently proportioned, is known in hydraulics as Venturi's pipe, and is used to increase the amount of the discharge through a water-nozzle. When this double-cone pipe is used in a bunsen burner, it "operates to increase the quantity of air forced through the pipe, and produces a more thorough mixture of the air and gas,



and at the same time delivers the mixture at a much higher pressure than the ordinary bunsen burner does." The lower one is the cone within which the air and gas are primarily mixed; the upper or suction cone is to accelerate the issue of the mixture at the point D. The patentee says he has found that the best results are obtained when the angle of divergence of the suction cone is between 5° and 7°. When the angle of divergence is increased beyond 7°, the suction diminishes; and it almost disappears when the angle becomes greater than 10°. The length of the mixing cone must be such as to permit the air and gas to be well mixed before the mixture reaches the narrow section; and this length of the mixing cone is determined experimentally in the following manner.

Over a jet of gas, issuing vertically upwards from a nozzle A (see fig. 2), is arranged a horizontal wire gauze E, so that its distance from the nozzle-opening can be adjusted. The mixture of air and gas is then lighted above the gauze; and by the appearance of the flame, it is noticed that the quality of the mixture varies with the distance of the gauze from the nozzle. This distance is then adjusted until the flame shows the characteristic of a self-burning mixture (as already explained, and which is dwelt upon more in detail further on). The proper distance, thus determined, is then used as the measure of the length of the mixing cone.

It is found that to obtain the best results, the suction cone should be about twice as long as the mixing cone. In practice, however, it is not necessary to make it quite so long, since it may be considerably shorter, and still produce sufficient suction for the purposes of the burner. But while the length of the suction cone may be varied considerably, without appreciably

affecting the suction effect, the same thing is not true of the angle of divergence of the cone, since, as above stated, this angle should be between 5° and 7°, and never more than 10°.

As an illustration of the dimensions of a burner constructed upon these principles, the patentee refers to a burner consuming 80 litres (2·8 cubic feet) of gas per hour. In this case, the narrow section D of the pipe should be 7 millimetres (0·27 inch); the length of the mixing cone, 3 centimetres (1·2 inches); and the length of the suction cone, 6 centimetres (2·3 inches). Now, the length of the suction cone might be reduced to 5 centimetres (2 inches), and might be made even shorter, and still have sufficient suction effect. The angle of divergence of the suction pipe, however, should always be within the limits of 5° and 7°, since any reduction of this angle below 5°, or any increase of the same above 7°, reduces the suction effect very considerably. It is, therefore, not sufficient that the bunsen tube be shaped so that its bore defines two truncated cones, joined at their small ends, since this general construction would be altogether useless for the purposes of the invention, unless the proportion of dimensions above indicated is carefully observed.

If a bunsen tube is constructed as thus far described, and without the nozzle F, shown in fig. 1, and the gas mixture issuing from the flaring opening of the suction pipe is ignited, it will not maintain a flame at and above the opening; since the velocity of the gas under ordinary pressure is not sufficient to prevent it from firing-back, downwardly into the tube. In order to prevent this, the nozzle by which the exit opening is reduced, is applied; and with a burner thus constituted the flame will be maintained at and above the nozzle.

Owing to the fact that the air and gas are forced together through the narrow section D of the pipe B, from the mixing cone into the suction cone, a tolerably intimate mixture is obtained. But in order to still more intimately mix the air and gas, the construction shown in fig. 3 is employed. In this case, the upper end of the suction cone is formed with a flange having two concentric grooves, as shown. Into the inner groove is fitted the lower edge of a hollow perforated cylinder G, the upper end of which is closed. The perforations of the cylinder are preferably conical, flaring inwardly, as indicated in fig. 4; and while these perforations are very small, the aggregate of their cross sections must be large enough to offer no appreciable resistance to the passage of the gaseous mixture. Into the outer groove in the flange, is fitted a hollow cylinder H, which, together with the perforated cylinder G, constitutes a mixing chamber. The cylinder, surmounted by a cap, terminates in the nozzle F.

An investigation of the flame, under various adjustments of the throttle-ring, shows the following results: When the throttle-ring is turned so as to completely close the air-admission ports C, the flame produced has the shape and characteristic of the flame of an ordinary bunsen burner, with its air-ports closed; but when the air-ports are gradually opened, more and more, in three successive steps, the appearance of the flame is as indicated in figs. 5, 6, and 7. First, with a slight admission of air, the flame is long, as fig. 5, blue in colour, with a central cone of a darker blue. Second, by increasing the admission of air, the size of the flame is diminished. The central cone assumes a greenish hue, and is surrounded by a blue envelope. Third, when the port-holes are entirely opened, the flame becomes much reduced in size. The central cone becomes quite small, loses its greenish colour, and appears to be enveloped by a violently agitated zone of a whitish hue. This is indicated in fig. 7, where the white cone is marked I.

The peculiar properties of the flames thus produced may be investigated in a variety of ways. In figs. 8 and 9, there is shown a chamber J, closely fitted over the burner-tip F, with an opening at top for the escape of the gas mixture. If the mixture is such as has been discussed with reference to figs. 5 and 6—that is to say, when only a moderate quantity of air is mixed with the gas—the mixture will burn at the opening of the chamber, as shown in fig. 8. It will not burn until after air from the surrounding atmosphere has been added to the mixture. But, when the gas mixture is such as has been discussed with reference to fig. 7, and when the mixture is ignited at the opening, the flame will immediately jump back, and burn at the nozzle F, although a small flame may still remain at the mouth of the top opening. This proves that the mixture produced, when the ports of the burner are wide open, or properly adjusted, is a self-burning mixture; and this is the kind of mixture of air and gas which must be produced in order to accomplish the results aimed at by the patentee.

The small flame which still remains at the top opening is due to a small portion of gas which is not burned at the burner-tip F; and this indicates that the mixture is not absolutely self-burning—that there is not sufficient air mixed with the gas. Now by the admixture of additional quantities of air, the small flame at the opening may be reduced to a minimum; thus showing that the mixture is more and more approaching the condition in which it is absolutely self-burning. It will now be understood, the patentee remarks, that for different qualities of lighting gas, and for different pressures, the air-ports must be adjusted differently, in order to produce a self-burning mixture; and the burner shown in fig. 3, with the addition of the top chamber H, is a convenient means for determining, in each case, the required adjustment of the throttle-ring.

The heating capacities of the different portions of the flames produced by the three different adjustments of the throttle-ring, contemplated with reference to figs. 5, 6, and 7, can be examined by the introduction into the flames of refractory filaments, as shown at K. In the case of the flame indicated in fig. 5, it is found that the filament reaches the highest degree of incandescence when it is placed within the outer part, and near the outer surface of the flame, and not when immersed in the interior of the flame. This shows that the most perfect combustion occurs where the gas mixture comes in contact with the surrounding atmosphere, from which it receives additional oxygen, while the combustion within the flame is comparatively very imperfect. With such flame as is in fig. 6, it is found that the filament is raised to the same degree of incandescence in all parts of the flame, from which it must be concluded that the degree of combustion is the same throughout. When comparing the degree of incandescence of the filament which just touches the outer surface of the flame (shown in fig. 5) with the degree of its incandescence immersed in the flame as in fig. 6, it is found that the incandescence is about the same—that is, the combustion in the case of fig. 6, throughout the flame, is of the same degree as the combustion on the outer surface of the flame in fig. 5.

If now the flame produced by the self-burning mixture, as represented in fig. 7, is explored with a refractory thread, it is found that it is raised to an exceedingly high degree of incandescence in the hyperincandescent zone I; while in all other parts of the flame the incandescence of the thread is comparatively low. These observations conclusively show that the highest degree of incandescence of a refractory mantle would be obtained by exposing it to the heating effect of the hyperincandescent zone of a self-burning mixture of air and gas; and it will presently be shown how this is accomplished.

Suppose a burner, such as described, with an ignited self-burning mixture issuing from it, be inclined, as in fig. 10, so as to make the side of the hyperincandescent zone along one line (the generatrix) vertical; and suppose that a refractory thread K, also extending vertically, be adjusted either near to or actually touching or immersed in the vertical portion of the hyperincandescent zone. Then the whole flame will take the shape indicated, and a considerable portion of the refractory thread will be raised to hyperincandescence. But supposing that this whole hypothetical structure be rotated about a vertical axis (as diagrammatically indicated), it is evident that the hyperincandescent thread will trace in space the surface of a cylinder; and if rotated fast enough, the eye of the observer will be impressed as by a hyperincandescent cylinder.

Fig 11.

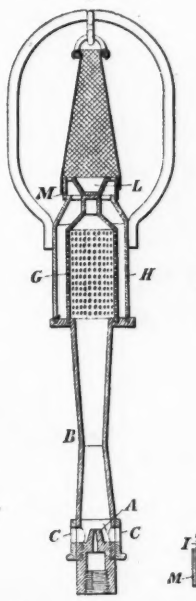
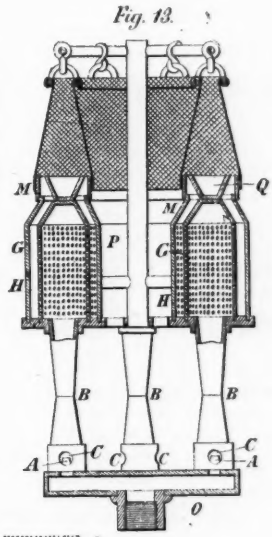


Fig. 13.



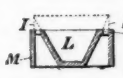


Fig. 12.

These considerations led to the following construction of the patentee's "improved incandescent gas-burner," the simplest form of which is shown in fig. 11. In this case, there is fixed upon the top of the cylinder G a conically flaring cup L, while upon the cap of the cylinder H is fitted a short cylindrical tube M. The dimensions of these two parts are such as to form between their upper edges an annular nozzle, from which the gas mixture issues in such direction that, when ignited, the outer surface of the hyperincandescent zone will be vertical, or nearly so, while the inner surface of the zone will be inclined outwardly. A mantle of refractory threads is fitted over the short cylinder M, and is suspended at its upper end from a copper hook fitted to a looped support, also of copper, which is secured to the exterior cylinder of the mixing-chamber.

A burner thus constructed does not require a draught of air along the surface of the mantle of refractory threads, since the combustion of the self-burning gas mixture is perfect without resort to such artificial draught. No glass chimney, therefore,

need be employed. The hyperincandescent zone of the flame of the self-burning gas mixture does extend upwardly, but not throughout the whole length of the mantle. A portion only of the length of the mantle, therefore, will be raised to hyperincandescence; while the upper part of it will be heated less, but still to a high degree of incandescence. The effect of the whole will be that "of an extremely highly incandescent body, much higher than is obtained by the ordinary incandescent gas-burners." It is further evident that the upper portion of the looped support will be heated considerably by the ascending jet; and being connected with the external cylinder of the mixing-chamber, it will heat the mixture within it by conduction, which is an additional advantage.

Instead of making the burner-tip in two separate concentric parts L M, it may be stamped out of one sheet of metal, and have the form indicated in fig. 12. But in this case the flame will not be completely annular; since the gas mixture will issue only by the sectoral ring openings N, or by a number of holes which may be circularly arranged. In each case, however, whatever be the shape of the burner-tip openings, the hyperincandescent zone I of the flame will have the shape shown by other lines in fig. 12—that is, one side will be vertical and the other inclined outwards.

For a greater amount of light, the duplex structure of incandescent burner shown in fig. 13 may be employed. In this case, there are a number of bunsen pipes, receiving the gas from a chamber O, upon which they are mounted. The upper ends of these bunsen pipes are fitted into a metal ring, which thus forms a common flange for the upper ends of the suction cones of the modified bunsen pipes. Into four concentric grooves, formed in the upper surface of the ring, is fitted the annular mixing-chamber P, composed of two concentric, cylindrical, perforated diaphragms and two concentric cylinders, both capped as shown. In this case, the burner-tip is composed of two concentric cylinders and an annular flaring trough Q, fitted upon the cap of the diaphragm. In this manner there are, in reality, produced two concentric annular burner-tip openings, which would furnish two concentric annular flames, each having a hyperincandescent zone. Upon the short outside cylinder is fitted the upwardly-converging mantle; and within the inner short cylinder is fitted the upwardly-diverging mantle of refractory threads. The two mantles are so arranged as to enclose between them an annular space, both the outer and inner walls of which are exposed to the heating effect of the hyperincandescent zone of concentric flames of the self-burning gas mixture.

This lengthy summary of the specification may be concluded by stating the claims advanced for the invention. They are: (1) The method of raising a refractory body to a high degree of incandescence, which consists in subjecting the refractory body to the heating effect of the flame of a self-burning mixture of air and gas in a burner constructed as described. (2) An annular gas-burner tip, for the consumption of a self-burning mixture of air and gas, consisting of an exterior cylindrical tube and a concentric interior, upwardly and outwardly widening conical tube, whereby the outer surface of the flame forms, approximately, as a vertical cylinder. (3) In an incandescent gas-burner, the combination of a burner-tip, such as is referred to in the preceding claim, with a mantle or hood of refractory threads, as nearly as practicable in superficial contact with the cylindrical flame. (4) An incandescent gas-burner, consisting of two concentric mantles or hoods of threads of refractory material, and two concentric annular burner-tips, each directing an annular flame into heating proximity to one of the mantles. (5) A bunsen burner for producing a self-burning mixture of air and gas, consisting of an upwardly-converging mixing-tube, into which the air and gas are admitted, and an upwardly-diverging suction-tube having an angle of divergence of not more than 10°. (6) A bunsen burner for producing a self-burning mixture of air and gas, "constructed and operating substantially as described with reference to the accompanying drawings."

SOCIETE TECHNIQUE DU GAZ EN FRANCE.

Annual Congress at Nice.

The Twenty-fifth Annual Congress of the above-named Society took place at Nice on the 20th, 21st, and 22nd ult., under the presidency of M. Ph. Delahaye. According to the report which appears in the "Journal de l'Eclairage au Gaz," the gathering may be reckoned among the most brilliant and agreeable the Society have had, though the weather was not very favourable for the projected excursions. Twelve communications, the nature of which has been already indicated, were presented; and they will be noticed more fully in subsequent issues. M. Delahaye will be succeeded by M. Vautier; the Vice-President being M. Alfred Lebon, and the Secretaries M. Visinet and M. Thibaudet. The morning of the 21st was devoted to the distribution of the prizes awarded by the Society to meritorious employees in gas-works, and the medals of honour bestowed by the Government. The Prefect of the Department (M. Le Roux) was present; and in a short address, M. Delahaye thanked him for the interest shown by the Government in the *personnel* of one of the most important industries of the country. Having given a brief sketch of the history and objects of the Society, he said that though at first their means were somewhat limited, they had already employed 70,000 frs. in rewarding 350 foremen and workmen for their good services by prizes of 200 frs. each. He then presented the 45 medals given by the Society; the Prefect following with 11 awarded by the Government. In the afternoon, the members visited the gas-works, at St. Roch; and in the evening the usual banquet took place. On the following day, the morning was spent at the Mont Gros Observatory, where luncheon was provided by M. Bischoffsheim; and in the afternoon the members had an excursion to Monte Carlo, where the gas and electric lighting works were inspected.

THE WELSBACH ELECTRIC LIGHT.

Heer C. T. Salomons, of the Rotterdam Gas-Works, writes to the number of "Het Gas" just to hand with reference to the note on this subject in the "JOURNAL" for Feb. 22 (p. 397). After giving a translation of the words there used, he remarks that the writer of the note "appears to find the heating of carbon, magnesia, or any other refractory material to the high temperature of the ceria of the mantle a very simple matter;" and he then quotes the statement that these materials "would emit the same amount of light as the Welsbach composition if merely heated to the same temperature." He justly says that the difficulty of employing other materials lies in our inability to raise them easily to the same temperature. We recognized this fully, and throughout the note ran a tacit admission of the superiority of the Welsbach composition to all other materials for *gas* lighting by incandescence. But the point it was wished to emphasize, it appears, has quite escaped the notice of Heer Salomons, and we may therefore repeat it in rather different words.

The difficulty of raising *by means of electricity* the Welsbach mantle composition to a given temperature is as great as that of raising any other refractory material to the same temperature. Therefore the Welsbach composition cannot be of special service in electric lighting as it is in incandescent lighting by means of gas or other combustible; and, indeed, we find this fact recognized by Dr. Welsbach in the Austrian patent specification recently published (*ante*, p. 879). In the descriptions of the filaments for his electric lamp, no mention is made of ceria, or a mixture of the rare earths such as forms the Welsbach gas-mantle. Thoria is utilized on account of its extremely refractory nature; but it is well known that a mantle of thoria gives a light of a few candles only when placed over a bunsen gas-flame. In fact, it emits just as much light as would a mantle of alumina or magnesia; and were these earths equally refractory at very high temperatures, they would serve Dr. Welsbach just as well as thoria for the construction of electric lamp filaments. The difficulty of raising them to a high temperature by electricity is no greater and no less.

Heer Salomons, in his subsequent remarks, emphasizes the advantage which the catalytic action of ceria in the Welsbach mantle gives gas over electricity. He considers that, by means of suitable combustion of coal gas, a light which should rival the electric arc light in intensity may be produced. The Welsbach composition will undoubtedly be the agent by which this result will be achieved.

WATER GAS AT THE VIENNA HOSPITAL.

We announced in the "JOURNAL" for Jan. 11 last (p. 76) that an installation on Dr. Strache's system for the supply of uncarburetted water gas was about to be erected at the large general hospital in Vienna. The formal celebration of the commencement of work with the new water-gas plant took place on April 16, and was attended by a large number of the professional staff of the hospital. Dr. Victor Mucha introduced the inventor of the system, Dr. Strache, who gave an address of which the following is an abstract translation.

The problem of smoke prevention in large towns has repeatedly directed attention to the advantages of heating by means of gas; but coal gas has been found to be too dear for general use for heating purposes. Nearly a century ago Fontana made water gas on a large scale; and within the last quarter of a century, it has been introduced by Quaglio and Blass for many industrial uses. In America, carburetted water gas has found extensive application. Uncarburetted water gas was, however, too dear for use in household grates; and it had the disadvantage of being useless for illuminating purposes. Even the invention of the Fahnehjelm burner, which enabled a fair illuminating duty to be obtained from uncarburetted water gas, did not bring it into favour. In order to manufacture the gas so that it would be sufficiently cheap for heating purposes, and yet be applicable to lighting, it was necessary that the following problems should be satisfactorily solved: (1) The production of water gas from coal or lignite in place of coke, which had so far been used. (2) Adequate purification of the gas. (3) The invention of a burner which would make the use of the Welsbach mantle possible.

The solution of these problems has been achieved after many years of toil; and water gas now takes rank as the cheapest of all illuminating agents. Four times as great a volume of water

gas is obtainable from a given quantity of coal as of coal gas; and the illumination from the water gas is to that from the same amount of coal gas as 8 is to 5. The following table gives some interesting comparisons of various illuminants. The figures in all cases refer to an illuminating power of 1000 candles (probably 1000 Hefner-units, equal to 877 English standard sperm candles) maintained for one hour.

—	Pounds of Carbon expended in the Production.	Units of Heat Developed.	Cubic Feet of Carbonic Acid produced.
Coal gas—ordinary burner .	66·1	41,200	1542
Acetylene	50·7	7·540	445
Incandescent electric lamp .	24·3	2,590	—
Coal gas—Welsbach burner .	15·4	11,000	412
Arc electric light	6·6	689	—
Water gas—Welsbach mantle	2·4	3,750	207

Hygienically, therefore, water gas compares well with coal gas, notwithstanding its higher content of carbonic oxide; for it is far easier to guard against the escape of unconsumed gas than to prevent contamination of the atmosphere by the products of combustion. With an hourly consumption of 7·063 cubic feet of water gas, an illuminating power of 150 candles can be obtained; but the reduction of the consumption to a quarter of the above quantity, reduces the illuminating power to 25 candles. Therefore the larger consumption shows the higher duty. Ten incandescent electric lamps give an illuminating power of about 160 candles, at a cost of about 4d., for which sum water gas, as adopted in the hospital, will afford 2080 candles. The light obtained from the water gas has not the greenish tone of the incandescent coal-gas light.

The installation will at present supply only the Pathological Institute with gas for lighting and heating purposes; and the estimated consumption is about 3½ millions cubic feet per annum. But the plant is capable of making a much larger quantity; and by degrees the supply will be extended to other parts of the hospital. Water gas, when consumed in special burners, is admirably adapted for laboratory use, as it furnishes a flame at which thin platinum wire may be melted. Cheap water gas should rapidly supersede coal for cooking purposes in households, as gaseous fuel has many advantages over solid fuel.

THE STAINES RESERVOIRS SCHEME.

Description of the Works.

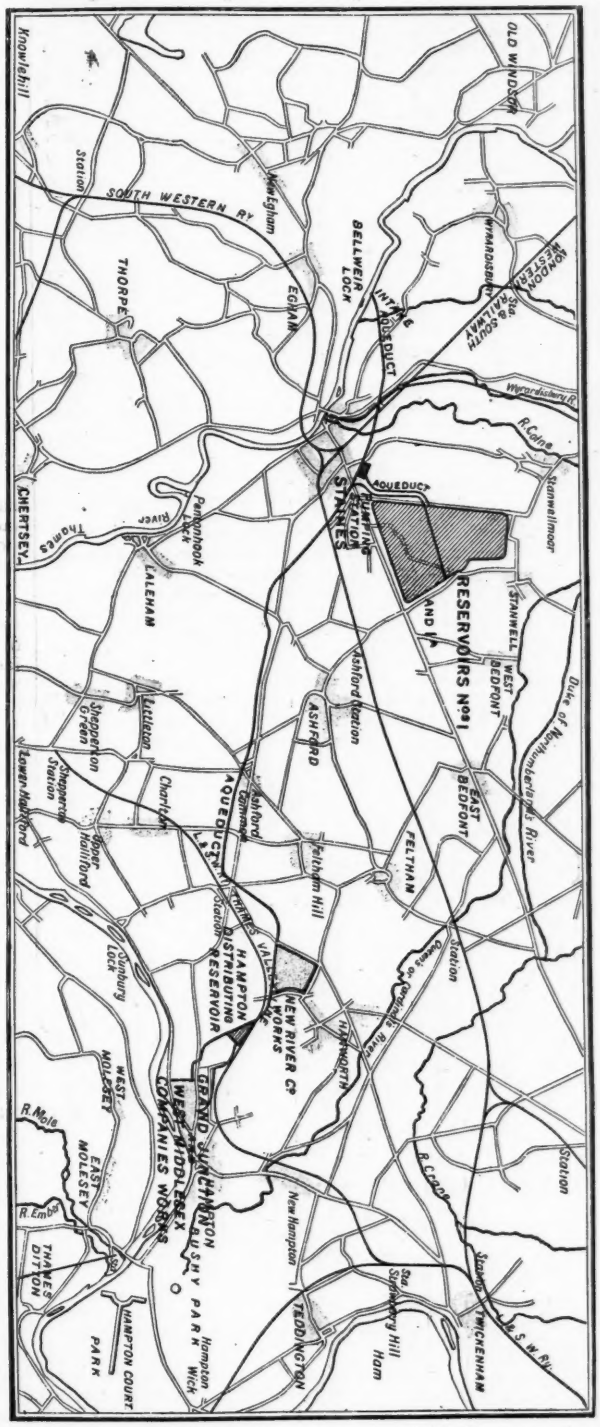
In the "JOURNAL" last week, the formal commencement of the above-named scheme was recorded. We now supplement the historical particulars then given by a short description of the works.

The intake from the Thames is situated on the Middlesex bank of the river, about 300 yards above Bell Weir, as shown upon the accompanying plan. At this point, sluices and a sluice-house will be constructed; the intake being protected by screens, to prevent leaves and other floating matters from entering the conduit. The first length of the conduit, for about 350 yards, is closed, as arranged in the Act of 1896. Passing from the intake in a north-easterly direction, it is syphoned under the Colne Brook, passing which it becomes an open conduit, the sides and bottom being formed of portland cement concrete in the proportion of about 5½ to 1. The conduit passes under the Great Western and London and South-Western Railways and the Wyrardisbury River through syphons, skirts Staines Moor, is syphoned under the River Colne, and runs between the linoleum works and Hammond's farm to the pumping-station, which is situated close to the Billet Bridge which carries the London Road over the River Ash.

The pumping machinery will consist of five triple-expansion surface-condensing Worthington engines (one being a spare engine), each capable of delivering 16 million gallons of water daily into the reservoirs. Steam will be provided by six Babcock and Wilcox boilers (one spare); the working pressure being 150 lbs. per square inch above the atmosphere. The water will be delivered into the reservoirs through two riveted steel mains, each 6 ft. 3 in. in diameter, joining into a steel pipe 8 ft. 8 in. in internal diameter near the reservoir, from which branch pipes of the same diameter will be taken down through a tunnel constructed in the clay, and connected to the water-tower near the corner of each reservoir, where the western and central embankments join. These pipes are believed to be the largest yet constructed. The tunnels and water-towers will be massive constructions of portland cement concrete—the former lined, the latter faced with blue bricks.

The stand-pipes for discharging water from the reservoirs will be of cast iron, 5 feet in internal diameter, having 48-inch and 36-inch sluice-valves, with bell-mouth bends fitted to them, to enable the water to be drawn off at any desired level. These valves will be worked from a platform at the top of the water-towers; the gearing being enclosed in a suitable building. From the bottom of the stand-pipe of each reservoir a cast-iron pipe, 4 feet in diameter, will convey the water through the tunnel and across the New Stanwell Road to a basin 50 feet in diameter, in which a weir will be constructed for the purpose of aëration, and over which the water will be delivered into the conduit, which will again join the main conduit a little to the east of the pumping-station. Proper sluices will be provided for regulating the supply into and from the reservoirs.

The reservoirs Nos. 1 and 1A will be situated at the spot shown upon the plan, and will be about 1¼ miles long by ⅝ mile wide at their northern end, and nearly a mile wide at their southern end, if the Staines Reservoirs Bill of the present session should be passed, as appears to be probable. The embankments will vary from 21 feet to 35 feet high, and will be formed of material excavated from the interior of the reservoirs; the excavation just balancing the banks to prevent the necessity and expense of running material to spoil. The slopes of the embankments



are three to one inside, and two to one outside the reservoirs. In the centre of each bank, a puddle wall will be constructed 6 feet thick at the top, 7 feet at the ground level, and tapering down to 5 feet, where it joins the London clay, into which it will be securely toothed. This construction, for which this part of the Thames Valley is favourably adapted, will make the reservoirs perfectly tight. The inside slopes of the reservoirs will be lined with concrete 5 inches thick for a depth of 15 feet, so as to resist any wave action which may take place in so large a sheet of water. The content of the reservoirs authorized under the Act of 1896 was 2500 million gallons. This it is proposed to increase to 3300 millions by the Bill above referred to.

This increase has been undertaken by the Joint Committee, because, having already purchased a portion of the land, the extension, which will be an additional safeguard to the Thames in times of drought, and will be in the interest of the consumers, can be made at a very moderate cost. The aqueduct and reservoirs will be guarded on all sides by unclimbable wrought-iron fencing; and the embankments will be sown with grass.

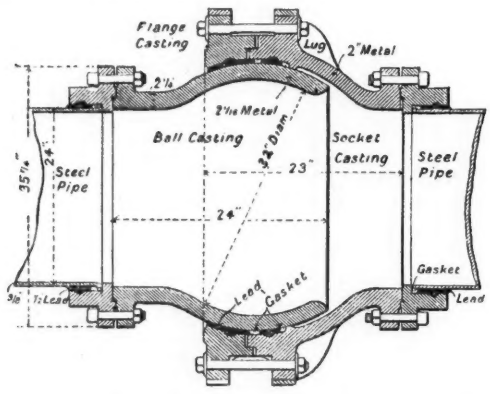
After leaving the pumping-station, the conduit will be reduced in section, and will run through the Billet Bridge by the side of Shortwood Common, under the London and South-Western Railway, and across the fields, pass under the Staines and Kingston Road, the line of which it will generally follow, until it arrives at Sunbury Cross. From this point the aqueduct runs in a north-easterly direction along the north side of the East London Water Company's works at Hanworth; after which it bends to the south, passes under the Thames Valley branch of the London and South-Western Railway, and is finally joined to a reservoir of about 30 million gallons capacity, which will be constructed to the east of Kempton Park. The New River Company will take its water from the aqueduct between the East London Water-Works and the Thames Valley line. The West Middlesex and Grand Junction Companies will receive their proportion of the water from the Kempton Park reservoir just alluded to. Proper measuring apparatus will be provided at the inlet from the Thames, and at the Companies' outlets.

The Joint Engineers for the scheme are Messrs. W. Hunter and R. E. Middleton, MM.Inst.C.E.; and the Contractors are Messrs. John Aird and Sons.

FLEXIBLE JOINTS FOR SUBMERGED WATER-MAINS.

A new pipe-line is to be laid to the City of Portland (U.S.A.) which will involve the crossing of the Willamette River, at a point where it is 2085 feet wide at high water, and 1270 feet wide between the harbour lines. The pipe will be laid in a dredged trench; and there will be 2000 feet of it, and 60 flexible joints—making a total length of 2100 feet. The depth at low water is 12 to 27 feet. The following particulars of the work are taken from a recent number of the "Engineer."

The pipe will be lap-welded steel tubing, 24 inches outside diameter, in lengths of 18 to 20 feet; and the steel is to be not less than $\frac{3}{8}$-inch thick. Soft open-hearth steel will be used. For every two lengths of pipe there will be a flexible joint having an angular movement of 15°. Each joint will consist of three parts—the ball, the socket, and the flange. These will be of cast iron, made from re-melted pigs of good grey iron, with a small quantity of best machine scrap. The balls and sockets will be cast upright, with the flanged end uppermost, and shallow recesses will be left in the flanges and sockets to secure the lead filling in place. All flanges will have an endless gasket of soft rubber put in the recesses shown in the illustration. This packing will be $\frac{1}{2}$-inch diameter for the smaller, and $\frac{5}{8}$-inch diameter for the larger flanges. All the bolts will be of iron, $1\frac{3}{4}$-inch diameter, there being 24 bolts to each of the smaller joints, and 34 to the main flanges.



Each joint will be put together and tested at the shop. The socket will be set on end on its small flange, and the ball inserted until it rests on the projecting ring or rib in the socket. A fibrous gasket will be inserted and driven home, and melted lead poured in. The ball will then be removed to allow an inspection of the work, again replaced, and the lead caulked. Another gasket will be placed on the lead, the main flange put in place and loosely bolted up, and another lead joint poured. The flange will be raised for an inspection of the joint, then replaced and bolted up. A hydrostatic test of 250 lbs. per square inch will be applied, the ball being moved from side to side during the test, and the joint must show no leakage. Rods will hold the caps together, so that the test will put no end strains on the joint. The steel pipes connected to the joints will have the ends flanged over to fit the socket of the joint flange. A gasket is put over the pipe, and lead poured behind it, as shown.

Each section of steel pipe will be tested by a hydrostatic pressure of 250 lbs. per square inch, and then coated with asphalte to protect it from corrosion. For this purpose it will be dipped in a bath of pure refined Los Angeles asphalte and natural liquid asphalte. It will remain in the bath at least 20 minutes, or long enough for the metal to attain a temperature of 280° Fahr., then withdrawn, the coating allowed to stiffen for eight minutes, and then re-immersed for a short time to thicken the coating. Where the coating is rubbed off in handling, the pipe must be painted with asphalte paint before being laid.

REGISTER OF PATENTS.

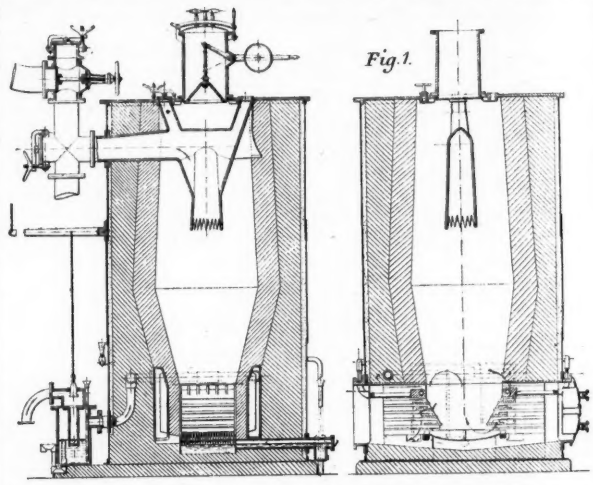
Incandescent Gas-Burners.—Kern, O., of Paris. No. 294; Jan. 5, 1897.

A full illustrated abstract of this patent specification appears elsewhere to-day (p. 1062).

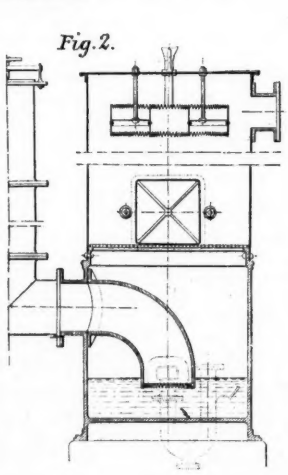
Producing and Purifying Gas.—Bellon-Lencauchez, J. A., of Paris. No. 8513; April 2, 1897.

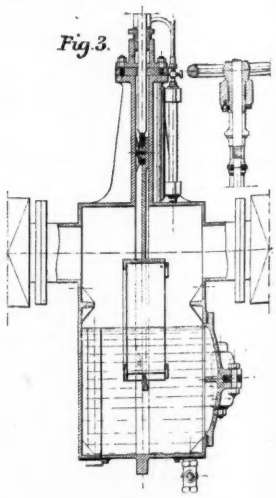
The claims advanced for this invention are as follows:—

A. In gas-producing apparatus (fig. 1), a grate formed of two stepped gratings and a horizontal grating, the capacity of which may be varied as desired by merely raising, more or less, the horizontal part of the grating in the furnace; this latter grating being supported by metal bars, adapted to rest in openings provided in suitable apparatus. A water-feed capable of being regulated as desired, and consisting of a box connected by a horizontal tube with the ash-pit bed; such reservoir being in communication with a waste-pipe, the opening of which is provided with a sluice, the section of the passage through which may be



diminished by means of a screw and hand-wheel. A conical air regulator connected with a balance beam following the oscillatory movements of the storeage holder receiving the gas; the cone serving to close the escape orifice of the regulator, which is provided with a water-seal, with the object of preventing a return of gas should the bellows stop working—the air thus introduced into the apparatus being first of all heated by circulation in a space provided around the furnace, and furnished with heat-conducting ribs or projections. A central gas-duct (with a serrated lower edge) communicating with two tubes, with the object of facilitating cleaning operations; the tube being provided with two openings placing them in communication with the upper part of the apparatus.





B. A washing-barrel or scrubber (fig. 2), into which the gas passes through a serrated tube, plunging into a liquid contained in the lower portion of the barrel, and which is surmounted by a column of coke traversed by a double current of water falling from a distributor placed above.

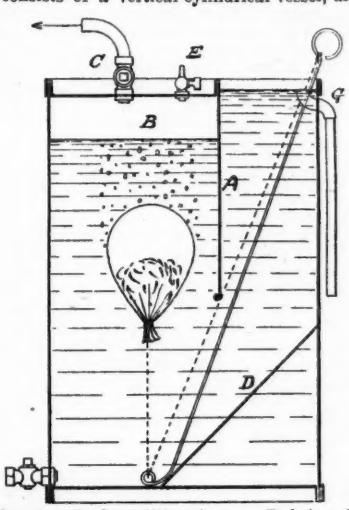
C. A purifier (fig. 3) acting by shocks, and constituted by a series of moveable gratings, which are adapted to be readily dismounted, and are formed by waved or undulating bars making an adjutage one with another; the bars of any one grating being arranged *quincunx* with regard to both the following and preceding grating, in such a manner that the tars may run off vertically in the concave portions of the bars, while the gases circulate horizontally around the bars. In the purifier is an arrangement of trough containing a liquid, in which are partially immersed the series of gratings, and adapted for being raised more or less with regard to the surface of the liquid, with the object of causing the section offered to the passage of the gas to vary.

Producing and Storing Acetylene.—Trouvé, G., of Paris. No. 12,110; May 15, 1897.

This invention relates essentially to the combination with the acetylene generator and holder, of a cock controlling the connection between them, and operated by the movement of the holder, and of a "safety syphon" permitting the escape of any gas in excess from the generator to the holder when the cock is closed. When the consumption increases, and the bell of the holder descends until a rod with which it is fitted opens the cock, the gas produced enters the bell, which begins to rise; and on reaching a predetermined position, the cock is closed. The production of gas then diminishes, and is altogether arrested by the driving of the water out of the generator, to be again renewed when the pressure falls and the bell again descends. Thus successive oscillations occur according to the consumption; the extent of the oscillations depending upon the length of the extensible rod referred to above. The rod is formed of a tube connected by a slotted link with the lever of the cock, and of a rod connected to an arm on the holder; a spiral spring being confined between the head of the rod and the end of the tube through which the rod slides.

Generating Acetylene Gas.—Dresser, F., of Liverpool. No. 13,081; May 27, 1897.

The patentee claims, in apparatus for generating acetylene gas by the decomposition of calcium carbide with water, the employment of bags formed of canvas or other flexible porous material, to hold a specific quantity of the carbide, and the method of enclosing the carbide in such bags before immersion in water, "for the purpose of preventing the quick generation of gas, by retarding the reaction due to the contact of the water with the carbide." The apparatus he has designed (as shown in the engraving) consists of a vertical cylindrical vessel, divided into two



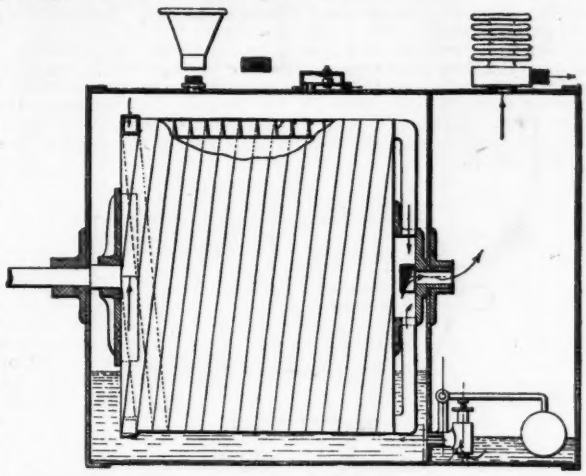
compartments by a vertical partition A; one, B, being closed in at the top to form a gas-chamber, and having an opening in, or a space beneath, the partition for communication between the compartments, and provided with a diaphragm or grid D slanting in the direction of the closed or gas compartment, designed to facilitate the introduction of carbide enclosed in the bags referred to above. The vessel is completely filled with water, prior to being charged with carbide; and while being filled, the air in the closed compartment is allowed to escape, either through a tap E provided for the purpose, or the gas-valve C may be of the three-way type and serve also as a vent for the air. The gas, as evolved, passes up into the closed compartment of the vessel; and as it accumulates therein, it displaces the water, which is free to rise in the open side and overflows at any predetermined point—such as G. This ensures a certain pressure being set up, but never exceeded.

Acetylene Gas Plant.—Whalley, D., Hacking, J., and the Ideal Gas Company, Limited, of Blackburn. No. 13,667; June 3, 1897.

The object of this invention is to manufacture and store acetylene gas "without loss through leakage and consequent liability of accidents," also to ensure as far as possible that no water shall enter the holder. The generator preferred is of the form described in patent No. 15,654 of 1896; and, apparently, the main object of the present application is to claim the arrangement of the pipes connecting the generator with the condenser and cooler and that between the condenser or cooler holder, in such a way that to whatever point the water in the vessels may rise, it cannot go as high as the bend of the pipes; and so neither water nor water of condensation is able to get forward to the next vessel.

Carburetting and Compressing Apparatus.—Van Vriesland, A. I., of Amsterdam. No. 16,907; July 17, 1897.

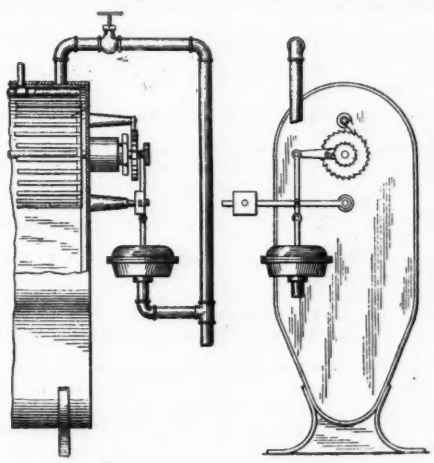
The apparatus which forms the subject of this invention is a carburetting and compressing apparatus capable of being applied for producing a gaseous mixture subsequently utilized in gas-mains; but it may also be used for producing a gaseous mixture conveyed, as it issues from the apparatus, to suitable heating burners.



The *modus operandi* of the apparatus shown in the engraving is as follows: Into the funnel at top is poured some hydrocarbon, which runs into the longer chamber, so that the level of the liquid is sufficiently high to allow the ends of the internal conduits to dip successively in the hydrocarbon as they are rotating. Rotary motion being imparted to the shaft, each end of the conduits will dip in turn into the hydrocarbon, and a quantity of the liquid enters. When the end of the tube is withdrawn from the hydrocarbon, it accomplishes one revolution in the air contained in the chamber, until it comes back to dip a second time into the hydrocarbon. As the conduit is a spiral, it successively contains liquid layers separated by layers of air; and owing to the rotary motion the liquid layers thus separated by layers of air will move in the first conduit from the left to the right hand of the apparatus. After a number of turns, a given portion of the liquid or gas, having entered the mouth of the first conduit, will pass through the first radial conduit into the central chamber. From this chamber, the air and the hydrocarbon proceed to the smaller or compression-chamber of the cylinder; the hydrocarbon sinking to the bottom, and the air spreading in this chamber. As the apparatus is regulated to a given pressure, the air which is highly charged with hydrocarbon (in consequence of its contact with the liquid) will not be able to escape until the pressure has reached a given degree; and as, on the other hand, the drum continues to rotate—so that carburetted air enters the compression-chamber constantly—this carburetted air will become compressed, and as soon as the required pressure is reached it will escape through the pressure-valve and enter the main where it is to be utilized, and the supply will soon become regular and continuous.

Acetylene Generator.—Dolan, E. J., of Philadelphia, U.S.A. No. 20,011; Aug. 31, 1897. Date claimed under International Convention, March 19, 1897.

This invention relates to an automatic agitator or shaker for acetylene gas generators, consisting of a rotating cage or compartment for holding the carbide, and adapted to have imparted to it automatically from time to time such a movement as will expose to the action of the water a fresh surface of carbide, and at the same time cause the refuse material

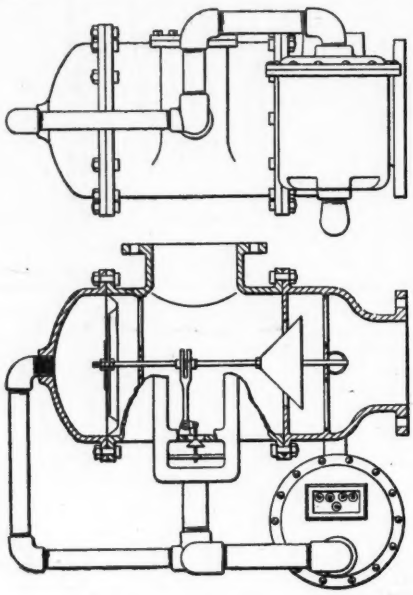


contained within it to be thrown out between the bars. The device is so constructed (as shown) as to effect these partial rotations of the cylinder at times when the pressure of the gas falls below a certain predetermined point, at which the device is set to operate—that is, when the pressure falls below a certain predetermined point water is admitted, which causes an increase in the pressure of the gas, and a consequent rotation of the cylinder. There is no rotation while the gas is falling below the pressure; but only when it has fallen.

Fluid-Meters.—Johnson, W. B.; a communication from the Pittsburg Supply Company, Limited, of Pittsburg, U.S.A. No. 190; Jan. 4, 1898.

This invention relates to proportional meters employed for determining the volume of fluid passing through a conduit or main—a portion of the

fluid being passed through a tally-meter. The meter has oppositely acting pressure-plates, arranged to control by their balance the valves for the measured and unmeasured volumes of the fluid. It also consists: (1) In a valve controlling a direct inlet to the delivery chamber of the meter; a pressure-plate acted upon by the unmeasured fluid entering the delivery chamber, which pressure-plate may be constituted by the inlet-valve itself; and a second pressure-plate acted upon by the measured gas passing from the tally-meter—the two pressure-plates controlling the inlet-valve. (2) In the last-named combination, wherein the meter delivery-valve, as well as the direct inlet-valve, is controlled by the pressure-plates.



In the engraving is shown a simple form of the apparatus. When working, the drop in pressure through the direct delivery-valve is so regulated that the drop in pressure through the meter delivery-valve will always be the same fractional part of it; and in every form the elements necessary to carrying out this principle are "one or more pressure-plates which are opposed by one or more pressure-plates acted upon by the fluid which has passed through the tally-meter." The high-pressure plate is constituted by the inlet-valve itself, or else by some other diaphragm or valve acted upon by the fluid, or by a combination of the two.

APPLICATIONS FOR LETTERS PATENT.

9462.—Naef, P., "Producing ammonia, cyanides, coke, and gas." April 25.
9482.—Guyenot, P. L., "Lighting and extinguishing gas-burners at a distance." April 25.
9527.—Binns, J. P. & H. G., "Gas and other engines." April 26.
9533.—Hersey, M. H., "Incandescent mantle shield." April 26.
9545.—Williamson, A., "Acetylene gas generators." April 26.
9594.—Silver, M. J., "Mantles for incandescent gas-burners." April 26.
9674.—Melhuish, J. B., Guthrie, M., and Hughes, J. H., "Acetylene lamps." April 27.
9718.—Strakosch, M., and Schmid, F., "Producing and burning acetylene gas." April 27.
9745.—Penman, A. H., "Improvements relating to the supply of gas to buildings." April 28.
9750.—Werner, W. A. P., "Acetylene generators." April 28.
9772.—Blackie, W., "Generation of oxygen gas." April 28.
9804.—Sauer, C., "Manufacture of incandescent mantles." April 28.
9813.—Banki, D., "Gas and similar engines." April 28.
9814.—Haddan, H. J., "Gas-burners." A communication from E. H. Brown and S. Goldner. April 28.
9867.—Bryant, C. H., "Internal combustion engines." April 29.
9890.—Chandler, S., jun., & J., "Prevention of vibration in fittings connected with incandescent gas lighting." April 29.
9899.—Burrell, L., "Fluid motors and meters." April 29.
9912.—Altman, M., "Chimney for incandescent gas and other lights." April 30.
9920.—Ireland, W., "Acetylene gas generators." April 30.
8923.—Pitt, J., "Lighting and extinguishing gas-jets." April 30.
9954.—Taylor, M., "Gas-producing apparatus." April 30.
9988.—Müller, J., "Quenching, transporting, sifting, and loading coke." April 30.

Fatal Escape of Gas at a City Hotel.—An inquest was held last Thursday by the City Coroner (Mr. S. F. Langham) on the body of William Davies, 78, a colliery proprietor, of Pontypridd, who was found dead at the Waverley Hotel, Cheapside, on the previous Monday. Mr. Sephonia Williams, of Hafod, South Wales, identified the body as that of his father-in-law, who left Pontypridd for London on Saturday, to appear as a witness in a case at the Law Courts. He was not accustomed to gas in his bed-room. Lydia Barnett, a chambermaid at the hotel, said that Mr. Davies took a room there on Sunday evening. On the following morning, she knocked at his door several times, and, receiving no answer, entered and found him in bed. Apparently he had been dead some hours. She noticed that there was a strong smell of gas, and that the burner was turned on. Other evidence having been given, the Jury returned a verdict of "Accidental death."

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. George Livesey and the Management of The Gaslight and Coke Company.

Sir,—Who can deal with Colonel Makins? He tells Mr. White in writing that, provided the "increased output of gas" is maintained to the end of the year, the cement makers shall have an additional quantity of coke. The increase of gas is more than maintained; but by the Company's action (of which nothing was said to the cement makers) in largely increasing the make of water gas, there is no increased output of coke, and on this *new* ground Colonel Makins writes to Mr. White refusing to supply the extra coke.

I sent a letter to the "Journal" to controvert the statement in the "Reply" that "the gas supplied by the South Metropolitan Company is most inadequately examined." Authority for this statement is given in the marginal note "See Appendix (D), p. 33," thus making the appendix part of the "Reply." It shows that the charge of inadequate testing is founded on grossly inaccurate figures, which were exposed at the time, and in my letter in the "Journal" of the 19th ult. In spite of this, Colonel Makins says my shot is "a miss aimed at the wrong target," and denies that the erroneous figures form any part of the "Reply," and that the charge of inadequate testing was not based on the quantities of gas, "but only the distances the gas has to travel" and the areas of the districts of supply. I must therefore try a shot at these points; and for this purpose I find that Beckton gas is, or was then, tested at five places, and the average quality of the gas for twelve months, extracted from the Chief Gas Examiner's reports published in the "Journal" in that year, showed a maximum difference between the nearest and farthest of less than half-a-candle. The principal loss, as Dr. Letheby proved, is in the first mile or mile-and-a-half from the works. This is well known to engineers; and they also know that there is a further loss beyond the testing-stations in the capillaries or small mains, in which the flow of gas is sluggish or intermittent.

As to areas, it is said in the "Reply" that the Chartered has one testing place to 4½ square miles, compared with one to 8½ square miles of the South Metropolitan; but there is just about as much gas consumed in 4½ square miles of the richer district as in 8½ of the poorer. Consequently, there is little or nothing in the question of distances and areas, as there was nothing in the quantities, to justify the charge of inadequate testing on which to found an argument for the higher price of Chartered gas. My chief object has therefore been attained—viz., to make clear that the prescriptions of the Referees are such that the gas of the three Companies is fairly and adequately, and as nearly as possible equally, tested in accordance with the requirements of Parliament.

Another question of public interest raised in the "Reply" is that of 3-light slot-meters. This is a condemnation of the practice of all the gas undertakings in the kingdom; for I believe that, excepting the Chartered Company, all use 3-light meters. The charge is based on a statement in "Appendix (Q), p. 43," that "it is an established fact that an overworked meter registers against the consumer," and is as follows: "That for the supply of a stove consuming 30 to 40 feet an hour, a 3-light meter, which is certified to pass only 18 feet per hour, is a wholly inadequate, and looking to the provisions of the Sale of Gas Act, possibly *not a legal measure;* also that the systematic overworking of a meter (which must result when a 3-light meter is fixed where a cooking-stove is to be used), causes it to register 'fast,' so that the customer has to pay for more gas than he actually consumes." This charge of cheating the poor—for that is what it comes to—is, if true, very serious; and one would have thought that, before making it, the compilers of the "Reply" would have required something more definite than one of the statements in the Appendix of which Colonel Makins said in his letter last week that probably many of these statements are unreliable.

I have had twelve 3-light slot-meters, two of every make that we use, tested at their stamped capacity of 18 feet; then with a stove going full, and burning from 37 to 40 feet an hour; and then with the stove and three lights (we usually fix only two), when the consumption rose in some cases to 52 feet an hour. In practice, the stove and the lights are not usually burning together, for the cooking is mostly in the middle of the day. The results were exactly the reverse of the statements in the "Reply." In every case but one, the increased consumption caused the meters to register rather slower—that is, in favour of the consumer. The odd one registered the same for all three tests. The greatest difference was 1½ per cent. against the Company; the least, nothing; and all the rest were very near ½ per cent.—the average being a fraction less than ½ per cent. slow, or on a consumption of 20,000 feet about 4d. per annum in favour of the consumer. This is of no practical consequence either way. It was, however, a great relief to me; for, of course, when the charge in the "Reply" of cheating the poorer consumers first came to my notice, I did not suppose that the compilers could commit themselves to such a statement without sufficient reason. This will, I trust, show that the fears expressed in the "Reply" are groundless, and that the Chartered Company may well save some money by adopting 3-light meters, which are found sufficient everywhere else. Moreover, on the question of legality, is a 5-light meter passing 40 or 50 cubic feet an hour any more legal than a 3-light, for they are both working greatly in excess of their stamped capacity?

On the subject of meter-rents, I have nothing to withdraw or qualify. Circumstances alter cases. All extras are objectionable; but if the only fair and just method of making a charge is in the form of an extra, what can be said against it? Unlike ordinary trade, a separate measure must be provided for every customer, who ought to bear his own burden, and not spread it in the form of an average over his neighbours. This is more than ever necessary, especially for the Chartered Company, now that electric lighting converts hitherto large consumers into very small ones, who retain, according to the "Reply," the Company's meters rent free for a greatly reduced consumption of gas.

So far I have dealt only with questions of general interest, needing public notice. The sale of residuals is in the same category, on which something should be said on a suitable occasion. But all the other points of the "Reply" almost exclusively concern the Chartered Company,

and should, I think, be reserved for the general meeting, excepting one for which I must crave your indulgence, and that of your readers. The misstatements and inaccuracies (to use the mildest terms) of the "Reply" on this point compel me to trouble you. Colonel Makins introduced it to expose what he appears to think are my motives; saying, in reply to my speech at the meeting, that I did not mention the Nine Elms business, which was quite true, because it had no bearing on the points I felt it my duty to raise, and I had for a long time dropped all reference to it. He said, referring to me: "It was in his anger over that matter . . . that he wrote a letter to the late Mr. Phillips, in which he said he forgave him his share in the transaction, but that *he never would forgive the Governor or Mr. Field.*" I corrected it at the time, and would have said no more had not the misrepresentation and suppression of the truth been deliberately repeated in the "Reply" in the following extract, in which I have, and also above, italicized some words:—

> "There can, unfortunately, be no doubt whatever as to the existence, on Mr. Livesey's part, of personal animosity towards the Governor and Mr. Field, since he openly avowed it in a letter which he addressed to the late Mr. Phillips, in April, 1893, on his retirement from the position of Secretary and General Manager. This letter, being a private document, is not published in the Appendix; but it is in existence, and can be produced if called for by Mr. Livesey.
>
> "In this letter, Mr. Livesey stated that whatever he thought about his (Mr. Phillips's) action in the Nine Elms case had been wiped out, and that, as to the Company, all was put right by the expression of sympathy from some of the proprietors present at the meeting in February, 1890; but that he considered that the way in which this Company's Counsel and Mr. Field conducted the arbitration proceedings in question was most bitter, and worthy only of some pettifogging lawyer. He added that, while the Company gained £6000 odd, they lost their good name and also the opportunity of *purchasing* cordial relations with Mr. Livesey and his Company, and, further, *that he could never be on friendly terms with the two men, the Governor and Mr. Field*—the former because he had not stopped the action, the latter for his part in the arbitration proceedings."

Nothing can justify any man in saying he will never forgive, or never be on friendly terms with, others. Happily one never hears men, except in moments of passion, give utterance to such outrageous sentiments. I have never either said or thought it in regard to any man. I can understand Colonel Makins making such a charge in the heat of the meeting, and I forgive him for it. But to repeat it deliberately in the "Reply," after referring to and quoting from the letter itself, is too bad. He says the letter is a private document, and is not therefore published in the Appendix; but he gives an incorrect summary notwithstanding, and I am glad to say challenges me to ask for its production. I accepted the challenge, and asked for a copy; and here it is.

Copy of Letter sent to Mr. J. O. Phillips referred to by Colonel Makins at the General Meeting in February, in his Reply to my Speech.

Granville Hill, Eastbourne
(temporary address),
April 20, 1893.

Dear Phillips,—I was very sorry to hear of your illness, which I regret to learn has been so serious as to necessitate your retirement, on which I should have congratulated you had it been brought about by anything than failing health.

I hope, however, the rest and relief from business will result in your complete restoration to health, and that you will enjoy for very many years your well-earned retiring allowance.

In reference to your remark that "we have been, and very possibly may continue to be, pretty strong opponents in business," I should like to say that whatever I felt and thought about your Company's conduct of the action was wiped out so far as you were concerned when you wrote me the letter in January, 1890, the day after that poor fellow in Hyde Park made that incitement to murder" (me); "and as to the Company, all was put right at the general meeting in February, 1890, when the shareholders so heartily urged the Board to drop the unjust (as I always felt it) claim for damages. Your Company had brought the Gas Workers' Union into existence; and we fought your battle as well as our own, and certainly saved you from the domination of the Union and from [At the suggestion of a friend, I here omit, in the interest of the Chartered Company, and possibly of others, some thirteen words which if given would only make my case stronger]. I thought, after such an expression of feeling on the part of your shareholders, I might well trust your Board; but I was wofully deceived. Field and your Counsel fought the question with the most extreme bitterness, in a way worthy only of some pettifogging lawyer—of course, with the sanction of your Board. Your Company gained £6000 odd; but they lost their good name, and they also lost the opportunity of *securing* cordial relations with us, and I felt that I could never be on friendly terms with the three men who were mainly responsible for such action, until some reparation or acknowledgment was made.

I blamed the Governor and yourself and Field. Possibly you may not have known how the matter was carried on; but either you or the Governor could have stopped it if you had liked. However, as you are no longer responsible for the acts of the Company, it is a satisfaction to me to drop the feeling of enmity, and to wish you, with all sincerity, all possible peace and happiness as the consummation of your long and laborious working life.

Believe me,
Yours faithfully,
George Livesey.

I have italicized the word "securing," to contrast it with the very different word "purchasing" substituted in the "Reply." I also draw attention to the omission of the important qualifying words, "until some reparation or acknowledgment was made;" and in doing so, I repeat what I said at the meeting, and had said previously, "that one word of regret that they had not acted in accordance with the strongly expressed wish of the shareholders" was all I wanted.

In the "Nine Elms Encroachment," as Colonel Makins is pleased to call it, the South Metropolitan Company acted in accordance with the universal practice since the Districting Act of 1860, and also in full accordance with the law as universally understood, until the House of Lords put a new interpretation upon it. On receipt of the order from the South-Western Railway Company, I went to see Mr. Phillips, and suggested that they should allow the 5 per cent. discount, which would have kept the supply in their hands. The right course would have been a friendly action. However, I shall not trouble you with a repetition of the facts, or with more than one correction of the statements in the "Reply;" for, as I have already said, all that had taken place prior to the meeting in February, 1890, was then and there wiped out. That meeting made me quite happy on this question; but it is what was done afterwards that revived all the trouble. In the "Reply," it is incorrectly stated that the arbitration was held and the award made, and that "there the matter would, under ordinary circumstances, have ended; but, at the meeting of this Company on Feb. 7, 1890, a suggestion was made . . . that this Company should . . . forego these damages." The correction I have to make is that the arbitration did not take place until some months after that meeting, and that it was before the damages were assessed, and not after, that the shareholders so warmly expressed their feeling in favour of dropping the matter. The Governor says they could not have done so, and talks nonsense about a single shareholder preventing them. I would gladly have accepted the will for the deed; and if they had only at the next meeting said they desired to act on the suggestion of the shareholders, I should have been satisfied. They acted, however, in a diametrically opposite spirit, greatly increasing their claim—piling it up unjustifiably (as was proved by the large reduction made by the Arbitrator), as is sometimes done in those claims for damages with which public companies are too well acquainted.

The unfriendliness shown throughout, not the money—which was no loss to our shareholders, and no gain to theirs—is the difficulty. If the two largest gas undertakings—which are not competitors in business, and therefore should not be antagonists—were on cordial relations with each other they would greatly benefit, and the whole gas industry would participate. I will say no more on this subject.

We all desire to see the business of the largest and most important Gas Company in the world put on a sound and satisfactory footing. Last week you said it seems almost hopeless, and that is my feeling. I quote the following words from the "Reply:" "It will be seen that the reply of the Directors to these reckless charges of Mr. Livesey is not in any sense an apology, but is rather a vindication of the principles upon which the business of this Company has been, and will be, conducted by the Court"—principles that have placed them in a worse relative position than any other gas company of any importance in the kingdom. I will therefore conclude with one more attempt to convince the Court of this fact; for, until they realize their position, there is no hope of improvement. The surest test is the price of gas. The Chartered Company use well over two million tons of coal a year, and water gas in addition, and charge 3s. per 1000 cubic feet. There is only one concern in the three kingdoms using over 100,000 tons that charges a higher price—viz., Dublin; but theirs is probably the worst district in existence, for they have only about 26 customers per mile of main. West Ham comes next with 42; while the Chartered Company in 1896 had 140. There is no other large concern charging so much as 3s. I give all those using 20,000 tons and upwards that did so in 1896 (the last return available):

	Tons.		Price.
Chartered . . .	(about) 2,140,000	..	(now) 3s. 0d.
Dublin	133,000	..	3 5
West Ham	86,000	..	3 0
Tottenham	(about) 40,000	..	3 0
Hastings	,, 40,000	..	3 0
Preston (18-candle gas)	,, 40,000		(about) 3 0
Norwich	31,000		,, 3 5
Oxford	29,000	..	3 0
Cork	28,000	..	3 6
Bournemouth (Gas and Water)	24,000	..	3 3
Exeter	23,000	..	3 0
Eastbourne	22,000	..	3 0
Swansea	21,000	..	3 0
Mitcham and Wimbledon . .	21,000	..	3 8
Folkestone	20,000	..	3 0
Richmond	20,000	..	3 0
Tunbridge Wells	20,000	..	3 0
Guildford.	12,000	..	3 0
Watford	9,000	..	3 0
Falmouth	3,400 (less 2½ per cent.)		3 0

The above are all Companies. There are only two Corporations using 20,000 tons or more, and none over 44,000, charging more than 3s. per 1000 cubic feet, excepting one or two in Scotland that supply 22-candle gas and upwards. There are many small undertakings charging less.

I give a few examples, omitting all charging exceptionally low prices, and all the large companies, who charge from 2s. 6d. down to about 1s. 8d. :—

	Tons.		Price.
Brentford	141,000	..	2s. 11d.
Crystal Palace District	103,000	..	2 7
Brighton	75,000	..	2 9
Croydon	59,000	..	2 8
Wandsworth and Putney	49,000	..	2 4
Rochester	41,000	..	2 6
Kingston	33,000	..	2 10
Ipswich	23,000	..	2 10
Scarborough	22,000	..	2 9
Maidstone	21,000	..	2 4
Worcester	20,000	..	2 7
Isle of Thanet	17,000	..	2 8
Dover	16,000	..	2 9

None in either list, except Preston and Swansea, are near coalfields, and scarcely any of them can get coal so cheap as the Chartered. Brighton has been harder hit by the electric light than the Chartered. In many of these cases the price has been reduced since 1896—Wandsworth, for instance, to 2s. 2d. per 1000 cubic feet; but I believe there is no case in the United Kingdom of an increase of price since then, except the solitary Chartered, the greatest gas company in the world. Whether or not this justifies my criticism of the management, I leave your readers to judge. The "Reply" has given no answer.

GEORGE LIVESEY.

South Metropolitan Gas Company,
May 2, 1898.

P.S.—I regret the length of this letter. However, nothing but the most urgent necessity will compel me to continue this correspondence.

SIR,—For years past, Mr. George Livesey has mildly protested against the want of good management by The Gaslight and Coke Company, without any result, except the airy explanations of Colonel Makins, who in one of his half-yearly speeches compared Mr. Livesey to the prophet Jeremiah—presumably, on account of his always lamenting the decadence of the Company. Mr. Livesey seemed immensely pleased and hugely delighted at this elegant witticism, "because Jeremiah was about the most truthful prophet." This slight reflection on other prophets was greeted with "laughter."

These passages-at-arms between Colonel Makins and Mr. Livesey culminated at the last half-yearly meeting. After the speech of the Governor in moving the adoption of the report and accounts, Mr. Livesey rose, and made comments of a very hostile character on the general policy of the Court of Directors, specially singling out the Governor and the General Manager. He added that "Colonel Makins had been Governor of the Company for fifteen years," which was "quite long enough to make or mar the concern," and bluntly stated that he had better "give up the reins." Mr. Livesey then attacked the Secretary and General Manager (Mr. Field); calling him "a triangular man in a square hole." This was not administered as the gentle accolade of a rapier, but like a swashing blow from a broadsword. With regard to the general policy of the Directors, the criticism was strong and trenchant. Then turning to details, Mr. Livesey dissected with merciless severity and unerring skill the questions of residual products, depletion of reserve fund, price of gas, dividends, capital, and carbonizing wages.

It is necessary for those who are outside to try to look at the matter fairly, without bias. Here is this huge monopolist Company, with a "market value" (according to Mr. Foulger) of £30,000,000, supplying with gas an area of something like 70 square miles, employing more than 10,000 persons, and with 300,000 consumers, and yet for years they have not earned their statutory dividend, and have been obliged to draw upon their reserve fund to the tune of nearly a million pounds.

After an interval of two months, Mr. Livesey's impeachment is answered by a "Reply" of 54 pages, defending the policy of the Directors, sent to the shareholders. Life is almost too short to read this piece of official pleading, the length of which is only exceeded by its feebleness; and it is disappointing from beginning to end. It has certainly dished up again a few old matters that everybody would like to forget, a sample of which is the "Nine Elms encroachment." There is also a biographical history of the Directors, who "decide all questions of policy and principle;" and of the modes adopted by the General Manager, and the Consulting and Constructing Engineer.

What the public want to know is why, with all this executive skill and ability, and this splendid machinery, 16-candle gas is charged for at the rate of 3s. per 1000 cubic feet by The Gaslight and Coke Company, and they then cannot pay the dividend, while the "one man" Company on the south side of the river can sell gas at 2s. 3d. per 1000 cubic feet, pay their dividend, add to their reserve fund, incur the cost of £100,000 over the late strike, and give their workpeople £130,000 by way of bonus. The reason is because it is a "one man" Company. The "one man" of the South Metropolitan Gas Company is a practical man, who does not take much notice of "red tape," or waste time with Consulting and Constructing Engineers, but simply consults himself, and does his own constructing—usually at about two-thirds the ordinary cost. He does not keep cats that catch no mice; and the "one man" is often heard to say: "We have got rid of the Union stroke." Perhaps this has something to do with cheap gas.

The "unkindest cut" in the "Reply" is that having reference to gas-testing; and it is indeed of supreme importance. The "Reply" states:

> But there is another advantage which the South Metropolitan Company possesses which renders its supply of "16-candle" gas much less costly than that of this Company. This is the position of the testing-places which are prescribed by the Gas Referees in relation to the Companies' manufacturing stations. It is now generally acknowledged, certainly by Mr. Livesey (see his letter of Aug. 6, 1896—Appendix B), that gas loses some of its illuminating power in its course through the mains. Mr. Livesey also claims that he is under no obligation (see his letter of July 3, 1895—Appendix C) *to supply 16-candle gas beyond the testing-places.* If, therefore, the testing-places in the South Metropolitan district are neither so numerous nor so remote from the works as in the case of this Company, it follows that the South Metropolitan Company can manufacture and supply gas of a lower quality than this Company can, and by this means largely save the cost of enrichment. This Company has *fifteen testing-places*, situated at distances from the works varying from 10½ miles to ½ mile. The South Metropolitan Company has *six* testing-places, situated at distances from that Company's works varying from 3½ miles to ½ mile. Here is an advantage to the South Metropolitan Company of 7 miles in the maximum distance its gas has to travel.

This innuendo is indeed discreetly veiled, but terribly suggestive. Those of us who read Mr. Dibdin's report to the County Council, and his subsequent speech, could not believe that he was serious. To obtain *kudos* appeared to be the Alpha and the Omega of the whole matter; for now that he has been relieved from the position he was "*so proud to hold*" at the Council, we have not heard much more about portable photometers, as he will find it is more pleasant and profitable to advise consulting clients about sewage, water, "wet mud" bacteria, and the rest of it, than bothering his head about gas-testing.

Further, this question of modes of testing or number of testing-stations has nothing whatever to do with Colonel Makins or Mr. Livesey. The stations have been placed where they are by the Gas Referees, who possesss full power to add to or diminish the number, as they see fit; and they have about as much to do with the impeachment as the man in the moon. If the present testing-stations are so senselessly arranged by the Gas Referees that they give Mr. Livesey an advantage, so as to enable him to sell gas at a cheaper rate than Colonel Makins, all that can be said is that the latter gentleman had better impeach the Referees for their want of care in foisting this great wrong of cheap gas on the consumers, especially as some of the Referees are, I believe, the colleagues of the late Mr. F. J. Evans, who was the first Gas Referee, and at the same time Chief Engineer to The Gaslight and Coke Company.

After twenty years' experience as a Gas Examiner all over London, it would not be difficult for me to prove that the testing-stations have been an unmixed advantage to all the Gas Companies. I therefore agree with Mr. Livesey that Colonel Makins would have done well to "let this 'sleeping dog' lie," and thus secure an advantage in perpetuity.

J. VINCENT TAYLOR.

April 30, 1898.

Workmen's Compensation Insurance.

SIR,—With regard to the Workmen's Compensation Act, 1897, and the rate proposed to be charged by the different insurance companies, I write to urge all managers to consider this subject most earnestly. I have had quotations from some half-dozen companies, and have found that 25s. per cent. was the rate quoted by all, with one exception. This one, I believe of good standing, offered to accept the risk for 12s. 6d. per cent. I am quite of the opinion expressed by Mr. Bower at the recent meeting of the North of England Association (*ante*, p. 1006), that it would be an easy matter for all gas companies to form a mutual insurance association; the risk being about the same in most works. We need not go very far to observe the good that has been done by similar societies in other branches of commerce—the shipping interest for one. All that I can see wanted is, as you most justly remark in the editorial of the 3rd inst., for someone to lead the way. Personally, I should be happy to render any assistance that lay in my power in forming such an association.

R. BEYNON.

Torquay, May 6, 1898.

Simmance's Gas-Regulator.

SIR,—My attention has been called to the "Register of Patents" in your issue for April 26, in which is illustrated a disc gas-regulator patented by Mr. J. F. Simmance. Will you allow me to state that the same, but in a much better form, was patented by me on Feb. 19, 1894, No. 3068, and was described and illustrated in the "JOURNAL" on Jan. 22, 1895? Mr. Simmance cannot have been aware of this; and it is certainly a grievance that the Patent Office will sometimes, even within a few days, grant patents for the very same invention.

D. BRUCE PEEBLES.

Edinburgh, May 7, 1898.

The Standardizing of Meter Unions.

SIR,—Some time ago, when the size of meter unions was under discussion, I suggested through your columns that it would be very desirable that the Whitworth standard gas thread should be fixed upon.

The question I notice is again very much to the front; and, from what I can gather, there seems to be a want of unanimity as to the best size to be adopted. This being so, I would again draw attention to the matter, in the hope that it may lead to a solution of the problem. I venture to think that there is hardly a manager but who would often have been glad if the boss on his meters had been so fitted; and as, for all practical purposes, I can see no reason against it, I trust, if any alteration is decided upon, that the Whitworth standard may have consideration.

S. CROSS.

Abergavenny, May 5, 1898.

Increase in the Price of Gas at Newcastle.—The Newcastle and Gateshead Gas Company have given notice of an increase in the price of gas of 2d. per 1000 cubic feet; and at the meeting of the City Council last Wednesday, attention was called to the fact by Alderman Newton, who moved a resolution instructing the Gas and Water Committee "to investigate the cause of the increase." The motion having been seconded, Alderman Stephenson, as a Director of the Company, explained that the contemplated rise in the price of gas was reported to the shareholders last January. It was due to the low price of residuals; the higher cost of coal; and to the fact that the Company were spending a large sum of money—probably £500,000—at St. Anthony's, for extension purposes. The interest on this outlay had to come out of revenue; and, in order to provide themselves with money to meet their liabilities as honest men, the only thing they could do was to give notice of the increase of 2d. in the price of gas. He was confident that the advance would be only a temporary one. It should be remembered that the shareholders of the Company suffered to the extent of 10s. per cent. in their dividend. At the same time he might say that the demand for gas was going up "by leaps and bounds" every week. The motion was agreed to.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Staines Reservoirs Joint Committee Bill, York United Gas Bill.

Bills presented, read the first time, and referred to the Examiners: Gas Orders Confirmation Bill (No. 2), relating to Cannock Gas, Colwall Gas, Crossgates Gas, and Slough Gas; Water Orders Confirmation Bill, relating to Broughton-in-Furness Water, Hayling Water, Portsmouth Water, Ross Water, St. Neots Water, and Wrexham Water.

Bills read a second time and committed: Crawley and District Water Bill, Anfield Gas Bill, Ilkeston Corporation Bill.

Bills reported, with amendments: Blackpool Improvement Bill, Hartlepool Gas and Water Bill, Market Harborough Gas Bill, Whitwick and Coalville Gas Bill.

The Cuckfield Rural District Council have petitioned against the Crawley and District Water Bill.

The Bacup Corporation Water Bill, the Bury Corporation Bill, the Carlisle Corporation Water Bill, the Halifax Corporation Bill, and the Hamilton Water Bill have been referred to a Select Committee, consisting of Lord Poltimore (Chairman), the Earl of Yarborough, Lord Calthorpe, Lord Chelmsford, and Lord Wimborne; to meet on Tuesday, May 10.

The Kettering Water Bill, the Newtown Water Bill, the Rochdale Corporation Water Bill, the Todmorden Corporation Water Bill, the Tynemouth Corporation Water Bill, and the Wath-upon-Dearne Urban District Council Bill have been referred to a Select Committee, consisting of Lord Hawkesbury (Chairman), Lord Boyle, Lord Hay, Lord Methuen, and Lord Monk Bretton; to meet on Wednesday, May 11.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Bakewell Gas Bill, Stirling Gas Bill.

Bills reported: Brompton, Chatham, Gillingham, and Rochester Water Bill, Gloucester Gas Bill, Ilford Improvement Bill, Rhymney and Aber Valleys Gas and Water Bill, Southend Water Bill, Wigan Corporation Bill.

Bill read the third time and passed: Aberystwyth Gas Bill, Folkestone Gas Bill, Staines Reservoirs Joint Committee Bill, Swansea Gas Bill, Wishaw Water Bill, York United Gas Bill.

The Plymouth and Stonehouse Gas Bill, the Southampton Gas Bill, the Edinburgh and District Water Bill, the Liskeard Corporation Water Bill, and the Yeovil Corporation Bill have been referred to a Select Committee, consisting of Sir H. Fletcher (Chairman), Sir H. Bullard, Mr. J. W. Logan, and Mr. C. Morley; to meet on Tuesday, May 10.

The Provost, Magistrates, and Town Council of Stirling have petitioned against the Stirling Gas Bill; and the Yeovil Gas Company, against alterations in the Yeovil Corporation Bill.

Last Tuesday, a return was ordered of the accounts of the Metropolitan Water Companies, made up to Sept. 30 and Dec. 31, 1897, in continuation of former returns.

THE GASLIGHT AND COKE COMPANY.

Last Thursday, Mr. Pickersgill asked the President of the Board of Trade whether, in accordance with his promise given on the 5th of April, he had considered the question of instituting an inquiry into the past and present management and working of The Gaslight and Coke Company, with a view to putting an end to the system whereby gas consumers on the north side of the Thames had to pay 3s. per 1000 feet, as against 2s. 3d. per 1000 feet on the south side; and whether he was now in a position to make an announcement on the subject. Mr. Ritchie replied: The Board of Trade have been carefully considering this question. They have no statutory power to hold an inquiry. If the hon. member thinks it desirable to move for a Committee of this House, I will see that the proposal receives careful consideration.

HOUSE OF COMMONS COMMITTEE.

Thursday, April 28.

(*Before Mr.* JOHNSON-FERGUSON, *Chairman, the Hon.* T. W. LEGH, *Mr.* VERNEY, *and Mr.* WENTWORTH.)

SOUTHWARK AND VAUXHALL WATER BILL.

This Bill is to authorize the Southwark and Vauxhall Water Company to acquire certain lands, construct additional works, take more water from the Thames, and raise further capital by the issue of debenture stock.

Mr. POPE, Q.C., Mr. DU CANE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., appeared for the promoters. There were ten petitioners against the Bill; but at the commencement of the proceedings only five of these were represented by Counsel. The following is a list of the petitioners: The Conservators of the River Thames, represented by Mr. LITTLER, Q.C., Mr. J. D. FITZGERALD, Q.C., and Lord R. CECIL; the Surrey County Council (Counsel reserved); the Chelsea Water-Works Company (Counsel reserved); the Lambeth Water-Works Company, represented by Mr. H. A. RIGG; the Vestry of St. Mary, Battersea, represented by Mr. FITZGERALD, Q.C., and Mr. J. C. EARLE; the Grand Junction Water-Works Company, represented by Mr. PEMBER, Q.C.; the West Middlesex Water-Works Company (Counsel reserved); the Corporation of London (Counsel reserved); the London County Council, represented by Mr. BALFOUR BROWNE, Q.C., Mr. WORSLEY TAYLOR, Q.C., and Mr. FREEMAN, Q.C.; and the Middlesex County Council (Counsel reserved).

Mr. BAGGALLAY opened the case for the promoters. He said that under the provisions of the Bill, the Company would be empowered to construct two additional storage reservoirs at Walton-on-Thames, in the county of Surrey. These reservoirs would be situated near the Chelsea Company's intake; and to enable them to be utilized, a new pumping-station, with aqueducts and conduits, would be erected. Another of the principal purposes of the Bill was to authorize the Company to take from the river—in a way which would be prescribed, and hedged round with many safeguards—an additional quantity of water to the amount of 20½ million gallons per diem, besides the 24½ million gallons which the Courts had held was the maximum quantity which the Company were entitled to take from the river at present. The measure also provided for the payment of a certain sum of money to the Conservators of the Thames, in consideration of the right to be conferred on the Company to take this extra quantity of water from the river. The payment to the Conservators, however, was not to be made to that body as in any sense being a commercial one, but was to be regarded as a payment to be made in order to enable the Conservators to carry out the duties imposed upon them in respect to the purification of the river, the maintenance of the flow, and similar works, which were directly or indirectly to the benefit of the Company, who drew their water from the river. Clauses had also been inserted in the Bill placing restrictions upon the taking of water from the Thames at certain times. Under these clauses, the Company would be restricted from drawing water at such times, or in such a manner, as to unduly diminish the flow of water in the lower reaches of the river below the Company's intakes. A matter which would be a somewhat leading one for consideration was that relating to the fixing of the point for the gauging of the flow of the river, to determine when the Company might or might not take the water. This matter was one of exceeding importance; and considerable misapprehension had arisen in some quarters as to the aim of the Company in endeavouring to fix the gauging-point at Molesey Weir, which was the spot named in the Bill. The Bill also proposed to confer power on the Company to raise £650,000, to enable them to carry out the works named therein. This money was to be obtained by the creation and issue of debenture stock, subject to the auction clauses, and to the application of the sinking-fund clause which had been inserted in the Bills of all the Metropolitan Water Companies seeking to raise further capital. The sinking fund was first insisted upon by Parliament in 1886, for the purpose of preventing an undue increase in the value of the undertakings of the Metropolitan Water Companies while the question of purchase by a public authority was under consideration. The learned Counsel, after detailing the history of the Company since the amalgamation in 1834 of the old Southwark Company with the Vauxhall Company, reminded the Committee that a Royal Commission which sat in 1892-3 to inquire into the London Water Question, had directed their attention specially to the quantity and quality of the supply afforded. Leading experts were examined before the Commission; and the conclusion arrived at was that, taking into account the possible increase of the population, the water of the Thames and Lea Valleys would suffice to meet all requirements until the year 1931—provided that a proper system of taking the water from the river were set up, storage reservoirs constructed, and restrictions imposed to prevent the taking of water when the river was very low, and when injury might be done to the lower reaches by its abstraction. The Bill now under consideration was designed to provide for the wants of the Southwark and Vauxhall Company's consumers, and probable consumers, up to the year 1913. For the sake of economy, and as a matter of foresight, the Company proposed to construct new storage for 1076 million gallons of water. The learned Counsel then proceeded to comment on the fact that only four out of the ten petitioners against the Bill were at present represented by Counsel. The Company, he said, were supplying a district containing a population of 812,875—one of the most populous of the London water supply areas. The districts of the New River and East London Companies were both larger, but those were the only two. The number of houses actually supplied on Jan. 1 this year was 121,136; and of these the number on constant supply was 113,489, or 93·68 per cent. of the whole. The district was a poor one; the receipts per house supply being smaller than those in any other. The proportion of houses of under £30 rateable value was 82 per cent. of the whole number supplied; but he only mentioned this because he anticipated suggestions would be made that the Southwark and Vauxhall Company could not supply water as cheaply as some of the other Companies. But it would be found, as a matter of fact, that though the rate per cent. on a house might be higher than in some other Companies' districts, the amount of water the consumers obtained for the rate they paid was considerably larger, save in one or two instances. The consumers were amply supplied with water. Dealing with the petitions against the Bill, he said that of the Lambeth Company declared that the land the promoters desired to take adjoined the property and was essential to the works of the petitioners. But the land had been unoccupied for years, and no attempt had been made by the petitioners to acquire it—notwithstanding that they knew as early as 1894 that the Southwark and Vauxhall Company desired to have it. The present opposition was purely obstructive. The contention of the London County Council that other Water Companies had the right to supply water in the Southwark and Vauxhall Company's district, he dismissed with the observation that Parliament was absolutely averse to competition. He traversed the other points dealt with in the petition of the London County Council; pointing out that there would be plenty of evidence forthcoming to controvert them. As to the petition of the Vestry of St. Mary, Battersea, which protested against anything being done to injure the scour of the river, he admitted that, being a riparian parish, they were entitled to be represented before the Committee. He argued, however, that the land water had very little effect on the scour. There were times when the amount of land water was of importance; but the promoters of the Bill had been careful to provide that the minimum flow contemplated by the Royal Commission of 1892-3, at Teddington and in the lower reaches, was preserved. This he was prepared to prove; and it would show that Battersea would not be injured by the Bill. Petitioners said there were other methods by which the Company could meet the demand for more water, and comply with their statutory obligations, than by abstracting water from the Thames. It was difficult to understand what this meant. If it meant what it appeared to, it was that the Company ought to seek a well-water supply somewhere else. But there was no suggestion that they should go in for a new scheme, or be refused powers

pending the failure of the London County Council or some one else to carry out a scheme. The suggestion was merely that the Company should get another supply. He warned the Vestry that if they succeeded in preventing the Company from augmenting their supply, they would be among the first persons to go short of water. With regard to the opposition of the Thames Conservators, this body said they were responsible for the navigation of the river and its preservation, both for navigation and pleasure purposes. They went on to declare that the Bill did not carry out the terms of the undertaking entered into last session, and that the result would be to injure the rights and interests of the petitioners. He maintained that in this the petitioners were mistaken—no doubt honestly mistaken. He insisted that the storage provision the promoters proposed would be sufficient to deal with the 20½ million gallons of water which was the extra amount to be taken under the Bill; and that the first reservoir would be constructed according to the arrangement of last year. It would be completed within seven years from Aug. 6, 1898, or eight years from the passing of the Act of last session. The second reservoir was supplemental to the one under consideration last year; and this they proposed to take ten years to construct, for the reason that it would not be required so soon as the other. It was only as the necessities of the district increased, that it would be needed. This reservoir did not affect any understanding or arrangement made with the Thames Conservators last year. With regard to the arrangements to be made for gauging the flow of the Thames, he submitted that the Conservators were wrong in their contention that the promoters had failed to carry out the understanding of last year. The question as to gauging had been left open; and if this were not the case, the words of the measure of 1897 had no meaning. The petitioners held that the point of gauging should be either at Bell Weir or Penton Hook; the one 13 and the other 11 miles from the Company's intake. These weirs were the next below the point of intake of the Staines Joint Committee; and he held that what they wanted to secure was that below the point of intake there should be a certain flow. They said they would not reduce the water below the intake; and therefore the natural point of gauging the lower reaches would be Molesey Lock or Teddington Lock. These were the locks from which they ought to determine the amount of water which should go to the lower reaches. The promoters had selected Molesey.

The Chairman remarked that between Molesey and Teddington there were the Chelsea and the Lambeth Water-Works; and he asked if they drew their water from these places.

Mr. Baggallay replied that they were merely emergency works which could only be used in certain eventualities.

Friday, April 29.

On the resumption of the proceedings to-day, evidence was given for the promoters.

Sir *Henry E. Knight*, the Chairman of the Southwark and Vauxhall Water Company, examined by Mr. Du Cane, said that Lord Balfour's Commission, which inquired into the Metropolitan Water Question, reported in 1893 that there was any quantity of water in the Thames to supply London with all that it would require for many years to come. But it was to be taken under certain conditions; the principal of which was that there was to be a large capacity of storage reservoirs. Following this recommendation, in 1894 the Company introduced a Bill, and were granted powers to construct storage capacity of 500 million gallons. They came to Parliament on the lines recommended by Lord Balfour's Commission, and Parliament gave them the necessary powers. Parliament thought the storage reservoirs were urgently necessary, and required the Company to construct them promptly. One was now complete; the others would be finished in the course of another year. The Company possessed parliamentary powers to take 24½ million gallons of water from the Thames per day; but during recent years, they had been compelled to draw more than this from the river. Their action was allowed to proceed unchecked for some time; but ultimately the Thames Conservators commenced an action for an injunction to restrain them from taking more than the legal quantity of water. Not wishing to press the Company, the Conservators entered into an agreement to stay proceedings while the Company sought parliamentary powers. The Company came forward with a Bill; and Parliament had given them power which would tide them over to the end of the present year. They had, however, bound the Company to come again to them this year for a measure to make a permanent arrangement; leaving as an open question the point as to where the gauging-station should be placed for the measuring of the flow of the Thames. The Company had seven square miles in their district still to be built upon; and therefore there was a great prospective necessity for water. He denied that there would be any damage done to the Thames by the Bill. Under the powers of the Bill, the Company would not be taking more water than they had been abstracting for years past. The object of the measure was not to give the Company more water, but to give parliamentary sanction to what they were now abstracting. He denied that the operations of the Company would reduce the flow of the Thames over Teddington Lock below the 200 million gallons, which was the minimum according to the evidence of Sir Alexander Binnie, the Engineer to the London County Council, necessary for the scour of the river. The Thames Conservators wished the gauges which were to measure the flow of the river to be placed above the proposed intake of the Company; but if this were done with the accretions to the river from its tributaries below the gauges, the flow over Teddington Lock would be some 400 million gallons, and the Southwark and Vauxhall Company would not be able to take a drop of the 200 million gallons over and above the quantity necessary to keep up the scour of the river. If the Company were not allowed to take this extra quantity of water, they would not be able to do what Parliament said they must do. The people who wanted the water would not, so far as he knew, be able to get it anywhere else. With regard to the petitions of the Water Companies, witness denied that the Bill would damnify them, and pointed out that the policy of Parliament was absolutely to discourage competition for customers among the Water Companies. He pointed out that, while the rate charged by the Southwark and Vauxhall Company was 5 per cent. on the rateable value of the houses supplied, that of the West Middlesex Company was only 4 per cent. on houses up to £200 value, and 3 per cent. on those up to £300 and £400. But the Southwark and Vauxhall Company gave a great deal more water; and measured by quantity, the rate they charged was much less than that of the West Middlesex Company. The charges of the Lambeth Company were higher than those of his Company. With regard to the petition of the London County Council, he said that this body aspersed the character of the Company's water; but in this, as in many other things, the County Council were utterly wrong. He would refer the Committee to the reports of the Government Examiners and Analysts, which were issued every month; and, above all, to the report of the Royal Commission of 1893, which declared that the water was of excellent quality. As to the Thames Conservancy petition, the Company had made every endeavour to carry out the understanding arrived at last year. If the Bill did not do this, the promoters would very soon make it do so—with the approval of the Committee.

Cross-examined by Mr. Fitzgerald, witness said that the instructions his Company had given to their legal advisers were that they were to carry out the agreement with the Thames Conservators to the letter. The Company were acting on the advice of their legal advisers. Mr. Baggallay said the previous day that if there was anything which had not been carried out, and which ought to be carried out, he was responsible.

In cross-examination by Mr. Rigg, witness said his Company did not wish to prejudice unfairly any of the Water Companies who took water from the Thames. One Company should not have an advantage over another in taking their share of the Thames—a share of that which was intended for the whole. He certainly thought there should be in the Bill a clause protecting the Lambeth Water Company from damage during the carrying out of the works. As to the land proposed to be taken for No. 2 reservoir, his Company were willing in 1896 to let the Lambeth Company have it, if they would put his Company in as good a position elsewhere. They had not said that "it would be a reasonable thing to let the Lambeth Company have the land." Whatever the agreement was in 1896, the circumstances of the case had greatly changed since then. If the Lambeth Company wanted this land, they should have taken steps between 1896 and now to acquire it. If the Lambeth Company were anxious to acquire the site of No. 2 reservoir for their works, and were prepared to find land for the Southwark and Vauxhall Company elsewhere, and to recoup them for any expense incurred, let them come to Parliament for the necessary powers to acquire the land. He did not think it would be right to put a clause in the Bill stating that, subject to compensation to be settled by arbitration, the Lambeth Company should have power to acquire the land.

Cross-examined by Mr. Pember, witness said his Company would deprecate the idea of having any priority of right to water in the Thames. Asked whether he thought a measure should be passed for the protection of the Grand Junction Company, stating that they should have temporary provision for the taking of extra water from the Thames, witness said he would rather see the Bill before he gave an opinion on it.

For the London County Council, the witness was cross-examined by Mr. Worsley Taylor. He stated that the promoters were proposing to raise £650,000. This would be a considerable addition to the amount of the Company's capital; and, manifestly, they were dealing with the matter on a larger scale, and on a permanent basis. The question of the purchase of the water undertakings by the County Council or some other body had been discussed by Parliament since the year 1880. Asked if he had any desire by the Bill—assuming that purchase might take place—to enhance the value of his undertaking, Sir Henry said the Bill and the works proposed spoke for themselves. Whether or not they would enhance the value of the undertaking would be a question for the arbitrator. All he (witness) would say was that the present works were a portion of those necessary to enable the Company to carry out their parliamentary obligations. If the works enhanced the value of the undertaking, the Company should be paid for them; if they did not, they should not be paid. The Chairman remarked that the Committee might take it that the more efficient the works were, the higher would be their value. Witness acquiesced; adding that these works hardly effected the efficiency of the undertaking. Filter-beds, mains, and so forth, were necessary for efficiency; and these things the Company had. The storage reservoirs were simply to enable them to supply the necessary amount of water to the public. In a certain sense, no doubt, they would increase the efficiency of the works. Mr. Worsley Taylor then put this question: "Suppose the Committee thought it would not be right to deal with the question in a permanent manner, but that it would be right to give you temporary powers, would it be difficult for you to continue your over-draft from the Thames for another two years?" Sir Henry replied: "We might have to come to Parliament again next year, and would be put to unnecessary expense. Our proposal now is a *bonâ fide* one to meet the necessities of our consumers." The witness was pressed to say whether, in his opinion, the present Bill was not anticipatory of the decision of the Royal Commission now sitting. He declined to answer the question directly; and, at length, the Chairman, interrupting, said the Committee did not want to have the opinion of the witness. They wanted facts from him. Proceeding, witness said that the system of filtration pursued by the Southwark and Vauxhall Company was as satisfactory as it could be. The population provided with water by the Company was 812,000; and they would be able, with the sanction of Parliament, to keep up this supply in future.

Mr. J. C. Earle then cross-examined witness with the view of getting an assurance from him that, in future, the mains of the Company should be laid at a depth sufficient to secure the public from the inconvenience occasioned during the hard frost of three or four years ago. Witness said mains would in future not be laid at less depth than 2 ft. 6 in., which was quite deep enough for all practical purposes.

Monday, May 2.

Mr. *J. W. Restler*, M.Inst.C.E., examined by Mr. Pope, said he had for fifteen years been Engineer to the Company. The greater portion of the water supplied by the Company was obtained from the Thames at Hampton. But some was drawn from wells at Streatham; the Company's district being divided into three zones—high, low, and middle. In 1882, the Company, on their own initiative, began to give a constant supply to their customers; and they had gone on from year to year extending the area of constant supply, until at the present time 93·63 per

cent. of their district had been so transferred. In 1886, parliamentary powers were granted to the Company to construct filtration works at Hampton. Further powers were granted in 1891; and again in 1894. The works under the Acts of 1886 and 1891 had been completed; and those authorized in 1894 were in an advanced state. The storage reservoirs now proposed would be sufficient to meet the needs of the Company, and had been designed with special reference to the suggestions made by Lord Balfour of Burleigh's Commission. The proposed reservoirs at Hampton—where the water was held as especially pure—would contain 1076 million gallons. This would bring up the storage capacity of the Company's reservoirs to 1539 million gallons; and this, on a basis of 40 gallons per head of the population per day, would yield a supply for 120 days up to the year 1911. What the Company sought was such a capacity of storage as would enable them to cope with the maximum demand. In August, 1893, the average daily supply was 33½ million gallons; in August, 1894, 34 million gallons; and in June, 1895, 39 million gallons—the last-named being a year of exceptional frost and drought. During the summer months of 1897, the daily supply averaged 37½ million gallons, with a maximum demand of a little over 43 million gallons; and the Company were now asking for powers to enable them to meet a demand of 45 million gallons. This they considered to be absolutely necessary to adequately meet the actual daily demand of 43 million gallons. Under the Bill, the Company would be unable to impound any water for their extra supply, unless 180 million gallons were flowing past Molesey Lock. This was to be the minimum flow of the river at that point; and if it fell below the amount, the Company would be bound to take their water from the storage reservoirs. These reservoirs were absolutely necessary if the Company were not to depend upon a hand-to-mouth supply; and the Thames Conservators required the Company to obtain them. With a flow of 180 million gallons at Molesey, there would be a flow of 200 million gallons at Teddington Lock; and this amount of water was considered by experts to be the necessary and proper quantity requisite to maintain the full scour of the river in the lower reaches. The Thames Conservators suggested that the gauging of the river should not be at Molesey, but at Penton Hook, ten miles farther up the river; but this, to his mind, could not possibly be satisfactory. In the case of the Staines reservoirs, the gauging was to be effected just below the intake; and this was what the promoters suggested should be done in the present case. They desired not to lose the benefit of the water drainage area for the ten miles between Bell Weir and Molesey Lock. At Bell Weir, the quantity of water passing over, according to the terms of the Staines Reservoirs Act, must be 265 million gallons per day. The accretion of water below Bell Weir was 88 million gallons down to Teddington Lock. The quantity of water authorized to be withdrawn from the river by the various Companies was 133 million gallons per day. The Staines Joint Committee had originally desired the right to reduce the flow of the river at Bell Weir to 250 million gallons; but after conference with the Southwark and Vauxhall Company, they agreed to leave the quantity at 265 million gallons, to enable the latter Company to take the extra 15 million gallons, which, with accretions, would be the quantity they required. If the gauging were done at Penton Hook, instead of at Molesey, the result would be that 53 million gallons of water would pass the Southwark and Vauxhall Company's intake uselessly; it would be absolutely lost to the public. He denied emphatically that any injury would result to the Thames by the carrying out of the present proposals.

Cross-examined by Mr. FITZGERALD, for the Conservators of the River Thames, witness said that Molesey was suggested as the gauging-point, in order that there might be a fair and accurate gauging of the river below the intake.

Mr. FITZGERALD: Is that your only reason for suggesting the point of gauging?

Witness: Certainly it is.

I would suggest to you as a reason that it is to enable you to take water from the river when the flow at Penton Hook would be less than 300 million gallons?—I admit that at once.

It is to enable you to get more water when the river is lower?—Yes.

Mr. FITZGERALD: Ah, now we have the real reason.

The CHAIRMAN: Are we to understand that no one is allowed to take water from the river when less than 300 million gallons pass over the Bell Weir?

Mr. FITZGERALD: No. The Water Companies, under their old Acts, have power to take 134 million gallons of water, without any regard whatever to the state of the river. But it became necessary to fix the minimum flow of the river; and this was done in 1896. The minimum flow was fixed at 265 million gallons at the Bell Weir, or 300 million gallons at Penton Hook. The Thames Conservators say that this limit ought to be adhered to.

The CHAIRMAN: But it is not adhered to?

Mr. FITZGERALD: Not under the old Acts of the Water Companies, unfortunately.

Witness, in further cross-examination, said that if the flow of the river at Penton Hook was 300 million gallons, the natural flow at Molesey would be 486 million gallons.

Mr. FITZGERALD: According to your proposal, when the three Companies interested in the Staines reservoirs are precluded from taking water at all, your Company would be able to draw 40 million gallons per day from the excess water. Is not that so?

Witness: No; we should only be able to take the 15 million gallons that have been referred to. I do not think that the best way to meet our requirements would be to extend our storage capacity. The Company are not seeking to override the opinion of the Thames Conservators (who are only interested in the preservation of the Thames for the good of the public), in order to advance the interests of their shareholders. The Company have not been dilatory in completing the reservoirs.

The CHAIRMAN: If it will meet the views of the Thames Conservators, are you agreed to construct your reservoirs in a shorter period?

Witness replied in the affirmative. The point was a small one.

Cross-examined by Mr. BALFOUR BROWNE, witness said that the position of the Company was practically the same this year as it was last.

Mr. BALFOUR BROWNE: Assuming that purchase of the water undertakings by some authority is shown to be the right thing, do you think you should be allowed to get any more out of the pockets of the ratepayers by this Bill than you would obtain if it did not pass?

Witness: I think we ought to be enabled to say that we are justified in taking the supply. If increased value comes from the extra supply, I think we ought to get the benefit of it.

The three Companies interested in the Staines reservoirs required £1,000,000 for their undertaking; and they secured it on condition that it did not enhance the value of their works to a purchaser beyond this amount. Do you think the Company should be put in a similar position in regard to the present Bill?—No, because in the case of the Staines reservoirs the supply was practically a new one, whereas we are asking for powers to enable us to discharge our obligations.

You mean to make good your defaults?—Yes.

If the passing of the Bill would prejudice the decision of the Royal Commission now sitting, should it be passed?—I think that if the prejudice were only as to money value, the Bill ought to be passed.

Then you want to enhance the money value?—I think we should be allowed to have regard to the requirements of the district.

Cross-examined by Mr. RIGG, witness said that, if the extra expense to the promoters of any concession they might make in regard to land near the Lambeth Water Company's works were repaid, there would be no objection to granting a concession.

Cross-examined by Mr. FITZGERALD for the Battersea Vestry, witness said he was aware that the quality of the water supplied by the Company had been complained of at Battersea. Steps were being taken to extend the filter-beds. He could not agree that if the Company "did not carry out their obligations," they should be subjected to a penalty.

In re-examination, witness said that if the present scheme were made of a temporary character, the promoters would not be able to construct their reservoirs. They would then have to take the additional water they wanted from the Thames without reservoirs; and this would be prejudicial to the interests of the Thames Conservators and of the public.

The CHAIRMAN: The London County Council ask whether you do not think that provision ought to be inserted in the Bill providing that, if within a certain length of time the control of the London Water Supply is handed over to some new body, you ought to receive for your undertaking a sum no larger than you would receive if the transfer were made to-day. I think you have given an answer to that question.

Witness: If the authorizing of this Company to take the extra supply increased the value of our undertaking, it would be an increase which we should be entitled to benefit from.

You think that what you are spending money on is increasing your capital expenditure?—No; these are non-dividend earning works.

But the Company will be in a better position for fulfilling their statutory duty after the reservoirs are constructed than they are at the present moment; and therefore the undertaking will be a more valuable one than it was before. Is not that so?—The arbitrator will probably say that the works are more valuable; but, on the other hand, the dividend-earning power will be decreased. Under the circumstances, the Company ought to have the advantage of the increased value.

The report of the Royal Commission spoke of the estimated future requirements of the Water Companies. You furnished an estimate of 30 million gallons per day; and now you are asking for more?—Our estimate was based on a supply of 25 gallons per day. When we made the estimate, the supply had been decreasing; and we had not at that time had experience of the frost of 1894, and the drought of 1895.

Do you accept the figures given by Sir Alexander Binnie, Engineer to the London County Council, that from 35 to 40 gallons of water per head per day should be the supply?—Yes. The present scheme is based on figures inside that supply.

It was stated before the Commission that 200 million gallons of water per day could be taken from the river without storage. Do you agree with this?—I think no harm would result from it; but the Thames Conservators would object.

Mr. LEWIS COWARD asked leave to put a few questions to witness on behalf of the Surrey County Council, and the Chairman having consented, the learned Counsel cross-examined witness with regard to the flow of the river in the neighbourhood of Richmond and Putney, with a view of showing that Richmond Lock had been constructed in consequence of the attenuated flow of the river—due to abstractions by the Water Companies—and that an agitation was now on foot for another Lock between Putney and Wandsworth. Witness, however, held, both in cross-examination and re-examination, that the scour of the river would not be injured by the proposals of the Bill.

Mr. *R. E. Middleton*, M.Inst.C.E., said he had made a very careful study of the question of the Thames water supply, and could state that the actual flow of the river at Teddington, on an average of fifteen years, had fallen below 200 million gallons on seven days per annum. This was after the abstraction by the Water Companies under their existing powers of intake. The maximum number of days in any one of the fifteen years, on which the flow had fallen below the amount mentioned was fifteen; and, of course, in dealing with water supply, one must take into account maximums and not averages. Between Teddington and Richmond there was a very large influx of upland water into the river, amounting, he believed, to 220 million gallons per day. He considered that the storage proposed by the Company, in addition to that which they already had, was more than sufficient; and he thought that the point of gauging should be below the intake, and not above it. He never heard of a case where the point of gauging was above the intake.

The Committee adjourned till the following day.

Tuesday, May 3.

Mr. *Middleton*, in cross-examination by Mr. WORSLEY TAYLOR, said that he had been Assistant to the Royal Commission on Water Supply which was presided over by Lord Balfour of Burleigh. The Commissioners decided that the proper way of dealing with the overflow water of the Thames (so far as the evidence laid before them was concerned) was that which was subsequently sanctioned by Parliament in the case of the Staines Reservoirs Act. There was a proposal for the construction of some nine reservoirs; but the Staines scheme was the one which the Commissioners approved of. He was somewhat familiar with the proceedings of the Water Commission which was now sitting. The two proposals which were being considered by them were purchase or control of some sort or other over the water undertakings. If either of these proposals were adopted, no doubt the London Water Question would be dealt with in a comprehensive fashion.

Re-examined by Mr. BAGGALLAY, witness said that the only scheme for the storage of water in the Thames Valley considered by Lord Balfour of Burleigh's Commission, was that submitted by Mr. Hunter; but other plans than the Staines reservoirs scheme had since been sanctioned by Parliament, several Companies having obtained power to store water at Hampton. The reservoirs at Staines were designed in order to prevent the lowering of the flow of water below a certain point at Teddington. If the Southwark and Vauxhall Company were restricted from taking water unless 265 million gallons per day were passing over Bell Weir, by reference to the gauging there, they would have to provide a storage of 2700 million gallons. This would give them the requisite supply to meet the necessities of their district in the period during which they might have no water. To move the gauge and fix the minimum flow at Bell Weir the same as it was at Staines, would mean the doubling of the reservoir capacity.

Mr. BAGGALLAY: Who in the remotest degree would be benefited by the expenditure necessary to increase the storage capacity from 176 million to 2700 million gallons?

Witness: No one. There would be much injury done, but no benefit.

And such expenditure would fall sooner or later on the consumers?—Yes.

At the present moment, the Companies cannot take the first water of a flood?—They are obliged to do it.

Owing to want of storage?—Not only that, but on account of the terms on which the water is taken day by day, and the Conservancy restriction that it shall be taken on days calculated from midnight to midnight.

How many days in a flood ought to be allowed to elapse before you begin to store water in your reservoirs?—That would depend on the number of reservoirs available. With two, twelve days should elapse; if three, eight days; and if four, six days.

Have you any knowledge of any cases where the gauging of the flow of a river has been taken above the point of intake?—No.

Mr. *James Mansergh*, M.Inst.C.E., examined by Mr. BAGGALLAY, said he had been one of the members of the Royal Commission over which Lord Balfour of Burleigh presided to inquire into the question of the Metropolitan Water Supply in 1892-3. He had designed, and was carrying out, the largest water-works in this country—viz., the great Birmingham scheme for bringing water from the Welsh hills to Birmingham. He was familiar with the works of the London Water Companies. With many of them he had had to do professionally, including those of the Southwark and Vauxhall Company. He considered that the proper place to gauge the flow of the water would be at a point near the intake and below it. This he regarded as the common-sense view of the matter. If it were decided that the quantity of water taken from the river should be such as to leave a flow of not less than 200 million gallons per day at Teddington, clearly the Water Companies above should have the benefit of the gauging. If the gauging were done above the intakes, a great deal of water would flow past the intakes uselessly. All anybody cared about was the flow of the water over the weir at Teddington; and 200 million gallons was, in his opinion, an ample quantity at this point. He thought that the proposal made in the Bill was a fair and proper one. It would not be fair to make the minimum gauge in the case of the proposed new reservoirs the same as that relating to the Staines reservoirs at the Bell Weir, because under those circumstances the Southwark and Vauxhall Company would lose the benefit of the accretions between the Bell Weir or Penton Hook gauge and their intake between Sunbury and Molesey Lock. There was nothing in the proposals before the Committee contrary to the spirit of the report of Lord Balfour of Burleigh's Commission. The question was not as to the position of the reservoirs, but as to the storage of water in the Thames Valley, approximately near the intakes; the storage to be made by stages. He had considered the question of the quantity of water it was proposed to store, and agreed with the evidence already given by Mr. Bestler. The proposed new reservoirs would be constructed tentatively, one at a time, as the demand upon the resources of the Company developed.

In cross-examination by Mr. FITZGERALD, witness denied that the river would be injured by the proposals of the promoters. He agreed that it would be the function of the Thames to supply London with water for a long time to come.

The CHAIRMAN: Do you think the Grand Junction, the Lambeth, and the other Companies will have to come to Parliament in a few years for powers similar to those the Southwark and Vauxhall Company are now applying for?

Witness: I do.

The CHAIRMAN: Is the land up the river above Molesey suitable for the construction of these reservoirs?—Yes, above Molesey; not below. The River Mole comes in below; and it is considered that it would not be advisable to take that in, as it is a dirty river.

Could there be an arrangement made by which it might be seen that a Company took no more than its fair share of water?—Yes.

What would be the expense of putting up a measuring arrangement at Molesey Lock? We are told that it would not be a fair thing to put the Conservators of the Thames to the expense of constructing a second gauge.—Whatever the expense, I think it would not be reasonable to put the Conservators to the entire cost.

Mr. POPE said this point had been considered at a conference that morning; and the Company had decided that the extra expense should be borne by themselves.

Mr. *G. H. Hill*, M.Inst.C.E., said he had had forty years' experience in the construction of large water-works, notably of those at Manchester and Glasgow. He had been consulted by the promoters of the present Bill on the subjects of the minimum flow of the river and the best point for gauging. He considered that if a minimum flow of 200 million gallons were left at Teddington, no mischief would happen to the river below. The river very frequently got below 200 million gallons; and therefore, if the take were limited to times when the flow was in excess of 200 million gallons, no mischief would be done. He considered that the gauging should be at a point below the intake.

Cross-examined by Mr. FREEMAN: He would not admit that passing the present Bill might forestall the decision of the Royal Commission now sitting. The Commission might not report for five years.

Re-examined by Mr. POPE: Whoever acquired the control of the water undertakings in the future, they would have to carry out the works contemplated in the present Bill.

Mr. *Henry Rofe*, M.Inst.C.E., examined by Mr. DU CANE, agreed with the evidence of the previous witnesses in regard to the flow of the river and the point of gauging.

Cross-examined by Mr. LITTLER, witness could not say just what the difference would be to the Southwark and Vauxhall Company if the gauging were done at Penton Hook, instead of at Molesey. He could say, however, that a great deal of water would be lost if it were done at the former place; and the promoters would have to spend money unnecessarily in constructing larger reservoirs. He did not, of course, suppose that the Thames Conservators were moved by any other sentiment than a desire to protect the river.

The CHAIRMAN (to Mr. Littler): Is your point simply the cost of the construction and maintenance of a new gauging-station?

Mr. LITTLER: Not at all. We say that there should be much more than 180 million gallons of water flowing past Molesey as a minimum, and also that there should be only one uniform testing-place.

Mr. DU CANE intimated that this closed the case for the promoters.

The case for the opponents was then proceeded with; and it occupied the Committee till Friday. The Chairman then announced that the Committee had decided to pass the preamble of the Bill, subject to the insertion of clauses providing that, if the undertaking were purchased within ten years from the date of the Act, the powers thereby conferred should not be deemed to give additional value to the Company's undertaking, except in respect of actual capital expenditure. Clauses providing for a sinking fund were to be inserted, and also fixing Penton Hook Weir as the gauging-point, and prohibiting the Company from exceeding their authorized limit in the taking of water unless the flow at the weir was in excess of 285 million gallons per day, or reducing the flow beyond this quantity. Clauses similar to Nos. 5, 9, and 60 of the Staines Reservoirs Act were to be inserted; and also one protecting the Lambeth Company's mains, &c. The Chairman added that the Committee were of opinion that the Thames Conservancy should be empowered to control the taking of water from the river where the flow was falling rapidly. The Committee expressed the opinion that the question of water-rates should be dealt with in a General Bill affecting the Metropolitan Water Companies as a whole, and after the report of the Royal Commission now sitting. It was arranged that the clauses should be gone through on the following Tuesday (to-day). A fuller report of these proceedings will appear next week.

Cromer Gas Bill.—The progress of this Bill has been retarded in order to allow of the insertion of an additional provision, authorizing the transfer of the works to a new site. This has been arranged, on mutually satisfactory terms, between the Company and the Bond Cabbell Trustees, who petitioned against the Bill. It is anticipated that the Bill will now go forward without further opposition. Anyone who knows Cromer will appreciate the advantage of removing the works from their present conspicuous position; and this is to be carried out almost immediately, under the direction of the Company's Consulting Engineer, Mr. Percy Griffith, Assoc. M.Inst.C.E.

Incandescent Gas Lighting in Asylums.—The introduction of the Welsbach incandescent gas-light into the asylums under the administration of the London County Council has been attended with great success, both as regards the quality of the light and the economy of the system. Taking the Cane Hill Asylum alone, the saving in gas for the twelve months ending the 31st of March amounted to no less than 2,300,000 cubic feet. At this asylum, a man is employed whose sole duty is to attend to the lights, fix the mantles, &c.; and, after paying his wages, and also for the renewals of the mantles, chimneys, &c., the saving amounted to £200, in addition to the light being much better than it was before. The light has proved very economical in another way, because in certain asylums where the accommodation has had to be increased the gas plant would have been insufficient to meet the requirements of the extra wards had it not been for the reduction in the consumption of gas owing to the Welsbach light, whereby the authorities were enabled to illuminate the large additional premises without incurring considerable capital outlay for gas plant.

Gas and Electricity Affairs at Stafford.—At the last meeting of the Stafford Corporation, the Gas Committee reported that they had received a letter from their Engineer (Mr. J. Ferguson Bell) in which he stated that, for the last five years a very considerable amount of additional work had devolved upon him owing to the erection of the new electricity works, and applying for extra remuneration for the services rendered by him in connection with the obtaining of the Provisional Order for the electric lighting installation, for preparing the necessary drawings and specifications, and also for acting as Resident Engineer during the construction of the works, thus saving the engagement of an efficient Clerk of the Works. He pointed out that his predecessor had received £450 per annum, and the make of gas was then only 74½ million cubic feet, while now the output was more than double. During the time he had been at Stafford, the price of gas had been reduced 10d. per 1000 cubic feet and meter-rents had been abolished; while a sum of £23,400 had been paid out of gas profits in aid of rates, and £23,839 in reduction of the capital account. After full consideration of the letter, the Committee recommended that the sum of £250 be paid to Mr. Bell as remuneration for the extra services rendered by him, and that the recommendation be considered at the May meeting of the Council. Alderman Peach, in moving the adoption of the report, stated that the gas delivered during the year ended March 31 amounted to 148,275,000 cubic feet, compared with 143,503,000 cubic feet the previous twelve months; showing an increase of 4,772,000 cubic feet, or 3·32 per cent. This was very satisfactory having regard to the exceptionally mild winter, the introduction of the electric light, and the fact that their staple trade had not been very brisk. In the Electricity Department, the consumption during the past twelve months had been 52,231 units, as compared with 39,606 units in the preceding year—an increase of 12,625 units, or nearly 32 per cent. The report was agreed to.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, May 6.

(Before Mr. Justice STIRLING.)

Corporation of Dover and others v. Folkestone Water-Works Company.

This was a motion to restrain the defendants from sinking wells which might have the effect of diminishing the water supply of the Dover Corporation.

Mr. COZENS HARDY, Q.C., Mr. JENKINS, Q.C., and Mr. MARTELLI appeared for the plaintiffs; Mr. SHIRESS WILL, Q.C., Mr. UPJOHN, Q.C., and Mr. R. F. NORTON represented the defendants.

Mr. COZENS HARDY said he had to apply for an injunction to restrain the defendants from further sinking or pumping water from a shaft at Drellingone, in Kent, and from making or continuing any other works, or doing any other act, whereby the water of the Nailbourne between Lower Standen and Bushey Ruff, or in the underground stream or channel between the same places, or any other stream or channel which flows into or feeds the River Dour, which flowed past or supplied the lands, wells, ponds, reservoirs, mills, or works of the plaintiffs, or any of them, might be drained off or diminished in quantity, or polluted or injuriously affected, and from in any way interfering with the plaintiffs' rights to the water. The defendants were sinking a well to the north-east of Lower Standen, in such a position that it would inevitably tap and destroy the water which, according to the case for the plaintiffs, was underneath, in a confined and well-defined channel or stream. The work was not being done under parliamentary powers, but under the title of the landowner, Earl Radnor, who had given permission to sink the wells. The water was always passing in a defined subterranean channel, which came out at the Chilton pond, but occasionally appeared higher up at Lower Standen; and the Nailbourne was nothing more than the overflow of the subterranean channel which existed in the chalk in a perfectly defined and definite line. The effect of the pumping and the 20-inch pipe which defendants proposed to put down would be to abstract from the underground stream and the riparian owners a large amount of water. The point for decision was whether there was not a case made, of the strongest *primâ facie* character, that in this chalk district and valley there was what could only be described as a subterranean channel, in which water passed in a defined manner. If this were proved, the plaintiffs were entitled to the relief claimed.

Mr. JENKINS proceeded to read the affidavits filed on behalf of the plaintiffs; the first being by Mr. E. W. N. Knocker, Town Clerk of Dover, who said that the shaft now being sunk by the defendants was not required for the immediate wants of the Company; and he could only suppose that its object was to test the right of anyone to tap the underground channel which formed one of the sources of the Dour. The next affidavit was by Mr. H. E. Stilgoe, Water Engineer to the Borough of Dover. He said the Corporation Water-Works were situate on Castle Hill, and had supplied the town since 1855. The water was pumped from three deep wells, connected by adits and augmented by other adits in the chalk, into two service reservoirs. The water was obtained from the chalk in the Dover watershed, the greatest feeders to which were the waters from the catchment areas of the Dour and Alkham and the Lydden Valleys. The visible sources of the Dour were at Rushey Ruff and Watersend; but an intermittent spring or nailbourne, known as the Drellingore, rose at certain times after periods of heavy rainfall, and flowed over the surface of the ground—following the valley line from Lower Standen to the River Dour. The nailbourne indicated its appearance by rising near Chilton Farm. The defendants' well was being sunk within a few yards of the course the nailbourne followed when it broke out at Lower Standen; and if the water was drawn from the well in any large quantity, it would deplete the underground channel, and diminish the water in the River Dour by diverting the underground channel. Mr. Baldwin Latham, M.Inst.C.E., deposed that the point at which the defendants were sinking the well was outside the limits of deviation of the proposal of the Company now in Parliament. The well would tap a well-known and defined underground water-channel, by which the waters of a large area of upwards of 5 miles in extent converged at this particular spot; and the effect of sinking a well in the position named, if water in any volume was pumped, would be to entirely denude the wells immediately below, and to materially diminish the flow of water in the Dour and the volume of water at the wells of the Dover Water-Works. He was of opinion that defendants would never have gone to this spot unless they had known of the existence of an underground channel in which all the waters of a large collecting area were brought together. It was a well-established fact that the waters of the chalk moved in defined channels in particular directions, and that by a proper hydro-geological survey the direction in which these waters were moving underground in the defined channels was easily ascertainable; and consequently, with the knowledge now possessed, it was possible to sink wells with the absolute certainty of intercepting the underground flows of water. It was this knowledge that had enabled the Company to select the site in question, which was at the bottom of the valley, where they were certain to secure a large volume of underground water even in the very driest periods. This underground water was equally the property of the owners of land and riparian owners below on the various streams. He was of opinion that, for every gallon of water pumped by the Company at this site, the Dour would diminish in a corresponding degree; and that pumping would also to a corresponding extent diminish the volume of water now available for the Dover Water-Works.

Mr. UPJOHN then put in and read the evidence on behalf of the defendants. The first affidavit was by Mr. Wm. Boyd Dawkins, M.A., F.R.S., F.G.S., Professor of Geology at Owens College, who had been engaged for many years in various inquiries as to the water and the chalk formation connected with the water supply of Hull, Worthing, Brighton, Newhaven, Seaford, Eastbourne, Maidstone, Croydon, and the Metropolis. Having lately examined the ground in question, he was of opinion there was no foundation for the allegation that the two wells proposed by the Company were planted on the exact line of a defined underground channel or a subterranean watercourse leading from them to the visible waters of the Dour, and that consequently they would do serious injury to the surface waters of the Dour and the water supply of Dover by the abstraction of water for the use of Folkestone. After dealing at length with the manner in which water moved in the chalk, he said the water abstracted belonged solely to the owner of the surface. Looking at the distance of the proposed sites from the Dover wells, and taking into account the enormous quantity of water flowing into the sea at Dover and to the north-east of Dover, it was practically impossible that the abstraction of one or more million gallons per day by the proposed works of the Company could have any effect on the wells of the Dover Corporation. The water-bearing area of the chalk was so vast that the abstraction of a million gallons or more would have no appreciable effect on the general water-level. This had been the case in other chalk areas, such as Croydon. The water would be taken out of the subterranean water-bearing area which had its natural outlets in the sea and in the Dour. In his opinion, there was ample water in this chalk area for the supply of Dover and Folkestone, without injury to any existing interests. Mr. William Whitaker, F.R.S., F.G.S., deposed that there was no proof of any underground channel in the chalk, as suggested on the part of the plaintiffs. When the bourne was out, the water flowed in a defined channel between banks or slopes of earth or rock along the Alkham Valley, and at all times along the Dour; but when the bourne was not out in the Alkham Valley, the water being below the surface and the channel dry, there was nothing to show that the water flowed in a confined or defined channel, and there was no well-known underground channel. Mr. E. M. Eaton, Assoc.M.Inst.C.E., who was well acquainted with the district, and with the behaviour of water in the chalk strata as affected by alternations of dry and wet weather, said he was of opinion that defined underground channels of the character referred to by the witnesses for the plaintiffs were of extremely rare and local occurrence. The defendants' operations would not result in any appreciable diminution in the flow of the Dour, as that stream was also fed by water derived from the chalk hills to the north-east; while the allegation that the wells of the Dover Corporation would be affected was absurd, as they must derive their supply mainly, if not entirely, from the north-east. If it were otherwise, and the supply were obtained from the polluted Dour, the water could not be of the excellent quality which it was pronounced to be by the analysts who had examined it. He was of opinion that there was no ground whatever for the statement of Mr. Latham that there was a well-known and defined underground water channel in the Alkham Valley.

His LORDSHIP said he had heard quite enough to know the nature of the case. He was not satisfied, as at present advised, that the plaintiffs would be injured by the proposed wells, and he suggested that the motion should stand till the trial. If it was found that the pumping in any way interfered with the rights of the plaintiffs, the motion could be renewed upon giving a fortnight's notice.

Mr. COZENS HARDY said he would accept his Lordship's suggestion; and the motion accordingly stood over, with liberty to renew in case it should be necessary to do so.

Dispute as to the Public Lamp Service-Pipes at Luddendenfoot.

At the Halifax County Court a few days ago, his Honour Judge Cadman heard a claim by the Sowerby Bridge District Council for £11 3s. 2d. against the Luddendenfoot District Council. The Clerks of the two Councils—Mr. R. W. Evans for Sowerby Bridge and Mr. W. H. Boocock for Luddendenfoot—conducted the respective cases. The money was alleged to be due for work done and material supplied. The circumstances were as follows: Since 1890 or 1891, the Sowerby Bridge Council have supplied Luddendenfoot with gas, and have erected lamps where requested to do so, charging the cost for the lamps and services-pipes. In all instances the accounts presented were duly paid until the first item in the present claim, dated Dec. 5, 1896, was sent in. A member of the Luddendenfoot Council then discovered printed upon the Sowerby Bridge gas-notes the following words: "In all cases the Urban District Council will supply the service-pipes without charge when the length required does not exceed 30 feet." He drew the attention of his Council to these words, with the result that they repudiated any contract to pay for service-pipes within the 30-feet limit. Mr. Evans, for the plaintiffs, contended that there was an agreement between the two Councils pure and simple, and that the notice quoted had no application to the supply of public lamps, &c. His Honour took this view of the case, and found for the plaintiffs, but gave leave to appeal.

The Law Relating to Water Supply.

An interesting case came before His Honour Judge Edge at the Clerkenwell County Court last Thursday. It was a claim for arrears of water-rate brought by the New River Company against Mr. and Mrs. Ralfe, the owners of some house property at Hornsey. Mr. Debenham appeared for the Company; and Mr. Edgar Robins for the defendants. Defendants admitted the plaintiffs' claim (a sum of £32 13s.), but counter-claimed for £14 2s. 4d., which they asserted they paid to the Company in excess of the statutory rate. Mr. Robins explained the ground of the counter-claim. For some years the Company had sent in demand-notes charging the defendant 5 per cent. on the rateable value of the property. In 1894, Mr. Ralfe had occasion to look into the powers the Company possessed, and found that they were only entitled to charge 4 per cent. on the rateable value. From that time he only paid 4 per cent., but had not been able to recover from the "clutches" of the Company the amount overpaid. Judge Edge: But I think you will have considerable difficulty in doing so. This is surely an error of law, and not of fact. Your client evidently believed the Company had the statutory power to demand 5 per cent. when they had not; and he paid under that belief. It is a mistake in law, and a payment made under such an error cannot be recovered. It is everyone's duty to know the law. If your client had been foolish enough to pay 10 per cent., he could not recover his overpayments. If it were an error of fact, he could. Suppose defendant believed that his house was rated at £40 a year, when it was only assessed at £30, and a demand note had been sent in, and he had paid on the higher value, that would be an error of fact, and he could recover. Mr. Robins: If your Honour holds

this is a mistake in law, I have no case. Judge Edge: I cannot rule otherwise. Mr. Robins: It is a very hard case. Here one of the richest Corporations in the kingdom send in a demand note containing a deliberate overcharge. They must have known their statutory rights; but few of the public do. It is very hard. Judge Edge: It is hard. But you know the proverb, "Hard cases make bad law." The counter-claim was disallowed. Mr. Debenham applied for costs for the Water Company, which were granted.

Serious Charges Against a Manchester Gas Official.

At the Manchester City Police Court last Thursday, George Frederick Bateman was charged with having embezzled a sum of £4 0s. 2d. belonging to his employers, the Corporation of Manchester. Mr. Woodroff Fletcher, for the prosecution, said the prisoner entered the employ of the Corporation 33 years ago as a collector in the Gas Department; and after various promotions he was, in 1888, appointed cashier in the department. The charges against him were of two kinds—the first one amounting to his having, on April 21 last, embezzled the sum of £484 11s. 0½d. In describing the discovery of this, Mr. Fletcher said the cash-book, which was kept by the prisoner, was made up and balanced daily. On April 18 the book showed a balance in the hands of the cashier of £2367 18s. 6½d.; and this amount was found by the Deputy-Superintendent of the Gas Department (Mr. Price) to be correct, and was accounted for. On April 21 there should have been a balance of £2247 1s. 10½d.; but when the cash was counted by the Deputy-Superintendent, it was found to amount to only £1762 10s. 10d.—that was to say, there was a deficiency of £484 11s. 0½d. This was pointed out to the prisoner; and he was unable to account for it. Afterwards he admitted to the Superintendent (Mr. C. Nickson) that he had used the money for his own private purposes. The other case arose in connection with money received in respect of prepayment meters. The money from these meters was collected by the inspectors; and it was the duty of the inspectors at the close of each day to pay over all they had taken from the meters to the Rental Clerk (Mr. Hartley), who recorded in a book the names of the collectors, and the amount each paid in. It was his duty then to add up the amounts and pay over the total to Bateman, who thereupon initialled the book. The prisoner's duty upon receiving the money was to enter the amount in a book called the rental summary book, which should show what he had received from all sources; the figures afterwards being transferred to a cash-book. Instead of entering the amounts each day in the rental summary book, he seemed to have missed periods of several days; and it was found on examination that certain entries made did not correspond with the amounts received from Mr. Hartley, as shown by the latter's book, which the prisoner had initialled. In the majority of cases, the entry in the rental summary book accounted for a smaller amount than that handed over by Mr. Hartley. Sometimes the prisoner entered larger sums than he actually received; but an examination of the books disclosed that since 1892 the total sum entered in the rental summary book as having been received from Mr. Hartley was less by £1245 12s. 9d. than the sum actually received. When the audit was made in March last, something was found to be wrong with the accounts; and when the matter was mentioned to the prisoner, he admitted that there was a deficiency, but remarked that he did not think it was so much. He said he had appropriated the money for the purposes of the business of his son-in-law. The discovery was made by Mr. Smith, the Auditor of the department. Evidence in support of the foregoing statement was given by several witnesses. Mr. C. Nickson, the Superintendent of the Gas Department, said the prisoner first admitted that he had taken £300 or £400. He was suspended; but he came afterwards to the office and said he was there to see if he could do anything, or if anyone wanted to see him about the affair. He was told he was not wanted. Afterwards he asked whether he would be allowed to pay the difference between £1000 for which he was guaranteed and the amount he was short; but he was told that witness could not touch any of it. Detective Superintendent Caminada proved arresting the prisoner at his residence. When charged with embezzling £4 0s. 2d. on April 5, and the sum of £1700 during the last twelve months, he made no reply. Prisoner was committed to the sessions for trial.

Sales of Shares.—Yesterday week, 300 5 per cent. preference shares of £10 each in the Exmouth Gas Company were sold at prices ranging from £13 10s. to £14 2s. 6d. per share. The average price realized was £13 15s. 11d.; and the total premium was £1139. The next day, the following shares were disposed of at Maldon: Two £27 fully-paid shares in the Maldon Gas Company, at £46 10s. each; four fully-paid £5 shares in the Maldon Water Company, at £32 in the aggregate; 56 £10 debentures (4 per cent.) in the same Company, redeemable on Aug. 1, 1901, at prices ranging from £10 6s. to £10 12s. each. Mr. C. H. Halsey sold at Watford last Wednesday 131 fully-paid original £5 shares in the Rickmansworth Gas Company at £8 5s. and £8 7s. 6d. each. At a sale at Leeds on Tuesday, £568 18s. 8d. of new consolidated 7 per cent. stock in the Pudsey Gas Company changed hands at £197 per cent.

The Birmingham Water Scheme.—Last Friday, the Water Committee of the Birmingham Corporation received a telegram announcing the completion of the Knighton tunnel of the Welsh water scheme. Our readers may remember that portions of the conduit from the Elan Valley to Birmingham will be two tunnels, about 8 feet in diameter. One of these, 4¾ miles in length, and nearest to the Elan Valley, is the Dolau; the other is the Knighton, extending from the town of Knighton to the Lugg Valley, a distance of 2¾ miles. Headings for this tunnel were commenced at either end; and at the time of the visit of the City Council last spring, 1700 yards had been driven from Knighton and 1600 yards from the other end—leaving about 1000 yards to pierce. The two sets of excavators have now been able to join hands. The case of the Dolau tunnel, owing to its greater length and the need for shafts to remove the excavated material, was commenced in two sections. The first half was completed a month ago; and though the calculations and measurements had to be made upon the data afforded by a base line of only 16 feet at the bottom of a 300-feet shaft, they were so accurately worked out that the centre lines of the two headings met accurately as regards level, and with a horizontal divergence of no more than half-an-inch.

MISCELLANEOUS NEWS.

PROFIT-SHARING AT MESSRS. RICHMOND AND CO.'S.

First Distribution of Bonuses.

Last Friday was an important day in the history of Messrs. Richmond and Co., Limited. That history has not been a long one; but it presents a record of remarkable progress. When the undertaking was started over a blacksmith's shop in Warrington rather more than seven years ago, the "staff" could have been counted on the fingers of one hand; and the total of the weekly wages-sheet was within a five-pound note. Now the establishment in the town covers, after eighteen extensions—a bit here and a bit there—2 acres of ground; while premises almost as extensive have been acquired at Stratford, and handsome show-rooms opened in Queen Victoria Street. Altogether, nearly 600 hands are employed; and the amount of the wages-bill may be inferred from these figures. In the early days of the concern, Mr. Richmond, who then held the position of Managing-Director of the Company (of which he has since also become Chairman), was impressed with the value of profit-sharing as a means of binding employers and employed together; and at one of the social gatherings of the workpeople he promised that, if he had health and strength, he would make the business a success, and that when the Company paid 10 per cent. dividend he would endeavour to introduce some system whereby the employees would participate in the good fortune attending their labours. At a similar gathering about this time last year, he had the gratification of announcing that the dividend named had been reached, and that the Directors were prepared to divide the profits under a scheme the details of which he explained. Briefly stated, the bonus was to be calculated on the ordinary salary of the officers and the daily wages earned by the workmen in the course of the year. No account was to be taken of overtime; and the men on piece-work were to have their bonuses calculated on the amount they would have earned at their ordinary rate of wages in the regular working. If the Company's dividend was less than 6 per cent. on the ordinary share capital, no bonus would be paid; but if this dividend were reached, the bonus would be at the rate of 3 per cent., and would increase ¼ per cent. for each 1 per cent. rise in the dividend. The foremen were to be dealt with on a scale 50 per cent. higher. All employees, from the highest to the lowest, were to participate in the scheme, which was to be managed by a Committee composed of members elected by the Board and the profit-sharers. Half of the bonus was to be paid in cash, to the credit of the employee, and the other half in £1 preference shares of the Company, at par; or the whole would be issued in shares if desired. Mr. Richmond then announced that if the Company paid in the following year the same dividend as had then been declared—viz., 10 per cent.—every employee who had been with them for three months would receive 5 per cent. on the wages he had earned during the twelve months. This dividend has been paid; and, in accordance with the announcement previously made, the first distribution of share scrip and savings-bank pass-books took place last Friday in the new show-room at the Warrington works; this pleasant duty being kindly undertaken by Mr. George Livesey.

A small party, comprising Mr. Richmond, Mr. Livesey, Mr. J. Holmes (who is investigating commercial questions in this country as the Special Commissioner of the New Zealand Government), Mr. H. M. Thornton, the Manager of the Company's Stratford works, and several other members of the London staff, left Euston Station by an early train. On reaching Warrington, others joined the party, and an inspection of the works was made under the guidance of Mr. Richmond and the Manager (Mr. H. E. Ransome). The various departments having been passed through, the party took luncheon together. On returning to the works, it was found that the participants in the distribution had assembled on one side of the new show-room; the rest of the men being present as spectators. Upon the platform were Directors of the Company and several gentlemen who had received invitations. Among them was Mr. W. P. Hartley, who has for some years had a profit-sharing scheme in operation in his extensive jam-making works at Aintree, near Liverpool. Mr. Alderman Lennard, of Leicester, who had been invited, was unable to be present. Mr. Richmond and Mr. Livesey occupied seats at the table upon which were ranged envelopes containing the scrip and pass-books, prepared under the supervision of the Secretary of the Profit-Sharing Committee, Mr. H. P. Hughes, the Company's Cashier. Seated on the right of Mr. Livesey was Mr. Atkins, the senior member of the Board. In the course of a few explanatory remarks, Mr. Richmond said it was a privilege to have with them on that occasion Mr. George Livesey, without whom there would have been no profit-sharing scheme. He expressed the belief that the money to be handed over to the men would come back again in the shape of a desire on their part to increase the profits of the Company.

Before commencing the distribution, Mr. Livesey addressed the employees. He said his sympathies had always been with working men; and he esteemed their value and high qualities. It had been argued by the political economists of the old school that all wealth came from three sources—land, capital, and labour; but it had been shown by a modern writer (Mallock) that wealth came exclusively from ability. It was to the inventor—to the man of ability, foresight, and courage—that we were most indebted. Mr. Livesey cited the cases of Bessemer, Faraday, and Arrol as examples of men who possessed the qualities of which he had been speaking—men who, from humble beginnings, had risen to positions of eminence. Coming nearer home, he said it was Mr. Richmond's enterprise and ability that had created the business in which they were engaged, and in which opportunity was afforded them to rise to a higher position. The system of profit-sharing which had been introduced was a means to an end—it enabled a wage-earner to become a capitalist and an employer. Under the existing system, employers could not become personally acquainted with their men; but identity of interest could be secured by profit-sharing. It was not enough that a workman should give time and labour for his wages. He should also take an intelligent interest in his work—put brains into it. He would then become a better servant, and be entitled to a larger share in the business. The Directors of the Company would give them that share. He found the bonus to be distributed was not to be in cash, but one half was put into the Warrington

Savings Bank, and the other half invested in the Company's stock. No doubt some of them would rather have the money; but he thought that they would be very sorry indeed if they drew it out. The bonuses they were receiving were for six months, and were small; but for this reason they should be left. He was sure that if they did this they would never repent it. If they drew out their money or sold their scrip, the Directors would ask what was the good of introducing the system. The working man usually spent his money as he went along; and the result was that when he could no longer do his work, there was nothing left for him but the workhouse. He therefore impressed upon them the importance of practising thrift, and shunning the bad habits of drinking and gambling. This was the first distribution of certificates and bank-books, and it would not be the last; for Messrs. Richmond and Co., who were the pioneers in the introduction of a cooking-stove for working people, were doing a great and useful work.

Mr. Livesey then proceeded to hand to each employee as he passed the table the envelope bearing his name and number, accompanying it, in the case of the younger ones, with a few words of encouragement. There were altogether about 300 participants in the distribution; the amount of the bonuses, which were calculated on six months' profits, being something like £400. The scheme works out to about £1000 a year. At the close of the distribution, Mr. Livesey remarked that the whole thing had been arranged most admirably. If all the business of the Company was as well done—officers and men working together—they must succeed.

Mr. Hartley, as one who had taken great interest in profit-sharing, followed with a few remarks. He said he adopted it ten years ago, and had had thirteen divisions. The first distribution was on a small scale —some £300 or £400. Last Christmas it amounted to £2730. He had been asked: "Does it pay?" He did not inquire into this question at all; he simply put himself in the workman's place. For 21 years he had devoted a share of his income to the good of humanity; believing that money was a talent to be used for the benefit of others. Profit-sharing was not in itself a cure for all labour troubles; but the spirit of it was. He cordially wished success to the work now inaugurated.

A vote of thanks was proposed to Mr. Livesey by Mr. Holmes, who apologized for the absence of the Hon. William Pember Reeves, the Agent-General for New Zealand, who intended being present, but was detained in London by important business. He remarked that if every gas manager in the Australasian colonies had seen what he had seen that day, there would be no home without a Richmond stove. Mr. Atkins seconded the proposition; pointing out to the men that as they were now sharers in the business, it devolved upon them, each and all, to check any tendency to waste. The vote having been very heartily accorded, Mr. Livesey briefly acknowledged it, and emphasized some of the points of his address. He dwelt specially upon the necessity for cordial relations between employer and employed if this great country is to retain its present position among the nations of the world. Mr. Richmond then reminded the men of the words used by his historical namesake in the course of his oration to the army on Bosworth Field—"If I thrive, the gain of my attempt the least of you shall share his part thereof"—which figured as an appropriate motto on the invitation card; and the pleasant gathering broke up.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers.

The examinations in "Gas Manufacture" conducted by the City and Guilds of London Institute were held last Tuesday. The following were the questions set by the Examiner, Mr. Alfred Colson, M.Inst.C.E.:—

ORDINARY GRADE.

1. Describe the first process in the manufacture of coal gas. 2. Describe, with sketch, the hydraulic main and dip-pipe. 3. What do you understand by condensation, and how is it effected? 4. Explain the use of an exhauster. 5. How are the impurities in gas detected? 6. Describe the course of the gas from the retort to the outlet of the governor. 7. Give a sketch and description of a pressure-gauge, and state its use. 8. Why are syphons used in connection with main-laying? Give a plan and section of one. 9. How is the illuminating power of gas determined? 10. Describe the incandescent burner.

HONOURS GRADE.

1. Describe and illustrate by sketches a method of making sulphate of ammonia from ammoniacal liquor. 2. Describe a method of enriching gas without the aid of cannel. 3. Give sketches and description of an untrussed gasholder and puddle tank. 4. In what way is gas freed from CO_2, H_2S, and CS_2? 5. Describe, with sketches, any two forms of scrubbers. 6. Why is air used in connection with purification, and at what point should it be introduced, and why? 7. State what you know concerning inclined retorts. 8. State the difference between ordinary gas coal and cannel, and the quantity of products obtainable from each per ton. 9. How are producer gases analyzed, and of what value are such analyses? 10. Why are short rather than tall chimney-stacks now employed for retort-houses, and how is their capacity arrived at?

Three hours were allowed for the paper in both grades; and the students were at liberty to answer all the questions, the number of marks for each of which was 30.

SOUTH METROPOLITAN GAS COMPANY'S ACCIDENT FUND.

The Results of Nine Months' Working.

In a letter on "The Workmen's Compensation Act, 1897," which appeared in "The Times" last Tuesday, Mr. George Livesey furnished some valuable information as to the working of the mutual accident fund of the South Metropolitan Gas Company. He explained at the outset that the results were "so unexpected, and at the same time somewhat disappointing," that he thought without such report the public notice that had been given to the fund and its rules might mislead both employers and workmen. He then proceeded as follows:—

In 1892 we began to record and make provision for all accidents; and on the data obtained during five years we based our accident fund, started in July last. In the five years 1892-6, 553 accidents were recorded, ranging from 80 to 137, and averaging 110 a year. The average number of accidents on the slowly but steadily increasing maximum number of men employed was almost exactly 3 per cent. per annum. The total cost, including pensions of not less than 10s. a week to widows of men who lost their lives, was less than 1d. per week per man. The allowance was 12s. a week to a man injured by his own fault; but from 80 to 90 per cent. of the cases received 18s. a week—the whole being paid by the Company at a cost of about £700 a year for about 3600 men.

The allowances under the fund are practically the same as before—perhaps dispensed a little more liberally. The contributions, however, are increased quite 50 per cent. The Company pay 1s. per quarter on the maximum number of men employed in any week during the quarter; and the men pay 2d. per month per man. Some increase in the number of claims was expected, and, of course, also in the expenditure, because when men contribute to a fund many feel it almost a duty to claim its benefits when an occasion or opportunity arises. The 50 per cent. additional income, however, was expected to leave a good surplus.

In the first six months, there were 115 accidents, equal to about 6 per cent. per annum on the number of men employed, instead of 3 per cent. as in the previous five years; while in the three months to March last the accidents totalled 102—bringing the percentage quite up to 10 per cent. per annum. The expenditure has not gone up in proportion, but in the last three months it was £409; showing, instead of the expected surplus, a deficiency on the quarter of £112. This expenditure was, in fact, more than double the rate in any of the five years which furnished the data for the fund. It is, however, the great increase in the number of accidents, rather than the expenditure, that is the serious matter.

The work has most certainly not become more dangerous. There has been no fatal accident—I believe not one causing permanent disablement, and very few at all of a serious nature; the great increase being in those of a trivial character. I am unwilling to suppose that the men have become more careless; but there is no doubt that slight injuries that previously passed unnoticed are now claimed as accidents under the fund. Disablement for three days entitles to payment—that is, if a man is incapacitated for three days, he is paid 9s. Consequently, there is some temptation (I am glad to say there are many men who do not yield to it) to get a few days' holiday out of a trifling injury—a bruised finger, for instance.

It may be said that nine months' experience is too short. But that depends on the number of men; and even for that period 4000 men give a fair average. At any rate, I give the information for what it is worth, because I am constantly receiving inquiries from large employers on the subject. Moreover, the Company's rules have been published in Mr. M. Roberts-Jones's admirable handbook on the Act; and I am anxious to prevent any mistake, seeing that some modification of the rules must be made before we apply for a certificate under the Act.

I am as strongly in favour of mutual funds as ever, believing them to be most beneficial to both masters and men; but I now think that claims for trifling accidents should be discouraged—paying as little as possible for them, while dealing with those of a serious nature in the most liberal manner practicable.

The framers of the Act are to be most heartily congratulated on their wisdom and foresight in excluding the first fortnight from compensation. Had they not done so, the Act would have wrought great mischief.

In regard to the above figures, Mr. Livesey informs us that whereas the Company under their accident fund paid an amount to their workmen of £351 in the first six months, they would only have paid £120 in accordance with the terms of the new Act—the difference being accounted for by the fact that the greater part of the accidents disabled men for only short periods, while the Act does not grant any compensation for the first fortnight a man is disabled.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Proprietors of this Association was held last Tuesday, at the Cannon Street Hotel, under the presidency of Mr. T. H. GOODWIN NEWTON.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting, and subsequently the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 31st of December last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended the 31st of December last was 4949 million cubic feet; the quantity made in the corresponding half year of 1896 was 4797 million cubic feet—being an increase of 152 million cubic feet, or at the rate of 3·17 per cent. The total number of lights on the 31st of December last amounted to 2,669,624; and at the close of the corresponding half year, the number of lights was 2,496,575, which gives an increase of 173,049, or at the rate of 6·9 per cent. The entire length of mains on the 31st of December last was 1960 miles; the length of mains on the 31st of December, 1896, was 1890 miles—an increase of 70 miles. Since the 31st of December, 1896, the number of the Association's consumers has been increased by 21,105, or at the rate of 10·6 per cent.

The revenue derived from the sale of gas increased in proportion to the greater volume of gas made; but the cost of production advancing in a greater degree, the net profit of the half year under review is somewhat less than in the corresponding period of 1896.

The average price of the coal carbonized was about 2d. a ton higher; and although there was an increase in the value of coke, it was insufficient to counterbalance the extra cost of coal, which amounted to about £20,000.

The market for both tar and ammoniacal liquor products continued depressed; but owing to the larger quantity produced, the gross value of these bye-products remained about the same as in the corresponding six months of last year.

As indicated by the low average percentage of gas unaccounted for—viz., 4·84—the condition of the mains is satisfactory; and the plant at all the stations was maintained at the usual high point of efficiency.

At Aix-la-Chapelle, the gasholder, which on the last occasion the Directors reported was being erected there, was satisfactorily put into action.

At the Gitschinerstrasse works at Berlin, the 26 benches of inclined retorts were also finished in time to enable them to assist during the past winter in meeting the increasing demands for gas at that station. The results so far obtained fully justify the Directors' anticipation that the somewhat heavy outlay entailed by the erection of these benches would be followed by considerable economy in the cost of production.

At Frankfort-on-Main, the important extensions which the Directors reported were necessary to enable the increasing demand for gas to be satisfactorily met are being proceeded with. The past winter has shown that additional producing power must be provided this year; and eight benches of inclined retorts are being erected on the Bockenheim works.

At Antwerp, the need of better accommodation for the clerical staff and the show-room and fittings departments having clearly manifested itself, the Directors purchased a suitable freehold site, and are erecting thereon commodious premises which they trust will meet the requirements of these departments for the future.

An opportunity having occurred at Lille to acquire some property abutting on the St. André works, which are much confined, the Directors availed themselves of it, and are maturing plans for utilizing the land to the best advantage.

At Aix-la-Chapelle, the Directors were able to enchange a plot of land at Borcette for one adjoining the Haaren works, with the result that the area of land available for extensions of these works has been materially increased.

Reference has been made in the last two half-yearly reports to negotiations with the Authorities of Amsterdam, for a continuance of the Association's operations in that city. These, however, led to no result; and on the 16th of November last, the Association received definite notice from the town of their intention to acquire by purchase the works and mains, on the terms prescribed by the contract, as from the 9th of August next. Consequently, provided that the necessary arrangements for the transfer are completed, the works and mains will pass into the possession of the town on that date.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 31st of December, 1897. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 31st of December last, payable, free of income-tax, on and after Tuesday, the 10th inst.

The Directors who go out of office by rotation are Colonel Josiah Wilkinson, Arthur Lucas, Esq., and Clarence Pigou, Esq. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is Montagu Somes Pilcher, Esq., who is eligible for re-election, and offers himself accordingly.

The CHAIRMAN, in moving the adoption of the report, said he would briefly allude to some of the topics in it, and then give information on matters which had occurred since the close of the half year to which the report referred. It would be observed that the relatively larger increase in the number of consumers than in the number of lights, and even more particularly than in the increase in the gas made, still continued. These relative increases were probably not so much now as formerly due to economies effected by the use of incandescent burners. The adoption of prepayment meters proceeded slowly. Still, the number in use at the end of last half year was more than twice as great as twelve months before. They made a very good solid prepayment meter at their meter factory in Berlin; and the Board were contemplating the extension of this factory. The report referred to an increase of 2d. per ton in the cost of coal, and also to the markets for residual products, coke, tar, and ammonia. But he might mention one item in the cost of production which had increased, was increasing, and, he believed himself, would continue to increase—namely, rate of wages. The late Chairman called attention to this matter years ago; and it had now prominently asserted itself. He believed that it was really due to the increase of wealth on the Continent, and particularly in Germany. These increases in the cost of coal and labour more than accounted for the deficiency of profit. An exchange of land at Aix-la-Chapelle was reported. They would perhaps remember that ten years ago they supplied gas there from two works—one at Borcette and the other the present works at Haaren. The Borcette works were closed in 1883, and the site turned into building land, which had been gradually sold at good prices. Half of what remained recently unsold had now been exchanged for land adjoining the works at Haaren, in the proportion of 6 to 1. This transaction was mutually advantageous to the owner of the land and to the Company. In the present report, as in the last two half-yearly reports, mention was made of the approaching termination of the Association's operations at Amsterdam. This would be by the acquisition, as from Aug. 10 next, by the Authorities of the town, of the Association's undertaking there, on the terms prescribed by the contract. It might be well that he should remind them of a very proper and important feature of these terms, which was that the town having the option of terminating the contract returned to them not only so much of the capital which they had expended on works, mains, and land as remained unamortized at that date, but, in addition, they paid the Association a premium of 25 per cent. upon such balance of capital. The statements of account relating to the money to be paid were in process of amicable arrangement between them. What was to be done with the money coming from Amsterdam, would receive the careful attention of the Board. Of course, the repayment of 4 per cent. debentures, which matured to the extent of about £376,000 in the course of the next eighteen months, was contemplated. On Jan. 13 a very serious and lamentable accident occurred in the valve-room at the Schoeneberg works in Berlin, by an explosion of gas. This resulted in the death of the foreman and four workmen. Their Chief Engineer in Berlin (Mr. Edward Drory) was quickly on the spot; and in consequence of the energetic steps taken by himself and his subordinates, the damage was confined to the valve-house, and the supply of gas to the town was not interrupted. The cause of the accident could not be determined, as all those engaged on the work in hand were unhappily killed. The Board had made suitable provision for the widows and orphans of these men. For a considerable time past, negotiations had been in progress, and still continued, with the Authorities of Haarlem for the prolongation of the contract there, which would expire in 1902. These negotiations had been conducted by Count V. Limburg-Stirum, with the technical assistance of their Engineer (Mr. Brender à Brandis). The Count had ably represented the Association there for the last 24 years; but early in March the Directors were grieved to hear that he had died after a very short illness. At Vienna, during the period covered by the report, no definite fact had to be recorded. The town was proceeding with the building of its single works outside Vienna for the universal supply of gas within it, and with the main-laying. They were beginning to experience the difficulties which the Directors had always anticipated they must encounter. These difficulties proved more and more the value of the producing and distributing plant belonging to the Association. The proprietors would remember that, of the contracts with the nineteen districts now constituting Greater Vienna, it was only the contract with the ten districts forming Old Vienna which expired next year. The town had, indeed, set up the contention that, as they incorporated in 1891 the nine outer districts with the ten inner ones, the contract with the former terminated as from the date of the incorporation; and that thenceforth the Association supplied gas in the nine outer districts under the terms and conditions of the contract—the more important one—with the ten inner districts, which, as he had said, would expire next year. Since the close of the half year the following fact bearing on the position at Vienna had, however, occurred—namely, that the Court of First Instance, in which the above-mentioned contention of the town had been raised, had decided in favour of the Association. Of course, the town had appealed against the decision; but the Board awaited the result of the appeal with perfect confidence. Otherwise he might say that the position at Vienna had not changed since they last met. To enter into any further detail, or to answer questions upon it, would certainly not improve the position; and the Directors therefore appealed to the proprietors not to ask such questions. In so doing, the Board incurred a measure of responsibility; but that was only incidental to their position as Directors. During the current half year, the Board had entered into contracts with four of the outlying suburbs of Berlin, where the Association's business was rapidly extending; and within the last few days, they had acquired a contract for the gas and electric lighting of a town in Bohemia of 20,000 inhabitants.

The DEPUTY-CHAIRMAN (Mr. J. H. Palmer) seconded the resolution, which was carried unanimously without discussion.

On the motion of the CHAIRMAN, seconded by Col. WILKINSON, a dividend of 5 per cent. was declared for the half year ended Dec. 31 last.

The retiring Directors and Auditor were afterwards re-elected.

On the motion of Dr. HADEN-HADEN, seconded by Mr. HORNCASTLE, a cordial vote of thanks was passed to the Chairman, Directors, and staff.

The CHAIRMAN, in acknowledging the vote, observed that, as Dr. Haden-Haden had said, the work of the Board was very responsible. He was sorry that one of their number was not present to hear the way in which the vote had been proposed and received—he referred to their old friend Mr. Bassett, who was temporarily indisposed. Not only the responsibility, but the work of a Board like theirs, increased day by day and month by month; and what it would come to in a short time he really did not know. They could not get on without their excellent staff at home and abroad; and he was sure that those who were present from the home office, and those who were members of the foreign staff, would thoroughly appreciate the vote of thanks to them.

The proceedings then terminated.

SOUTHAMPTON GAS COMPANY.

The Past Half-Year's Working—The Guardians and the Company's Assessment.

The Half-Yearly Meeting of this Company was held last Wednesday—Mr. R. C. HANKINSON, J.P., in the chair.

On the presentation of the report and accounts, which were noticed last week,

The CHAIRMAN first claimed that the progress of the Company was very satisfactory. A great point was that they sold during the half year 5,225,000 cubic feet more gas than in the corresponding period of 1896; and taking the whole year, the increase was nearly 23 million cubic feet. The only thing that was not quite so satisfactory as they could wish was that they had to draw £373 from the reserve fund to make up the amount required for dividends. He hoped that, under their new Bill, they would be put in a position to make more gas and so earn the dividends. The price of gas was very low compared with many other places. It was only 2s. 6d. per 1000 cubic feet in the town, and 3s. in the outside districts; and when it was remembered that these outlying districts extended five or six miles on the east and west, it would be seen that it was not a large sum, especially as the Gas Company supplying the North of London charged 3s. everywhere. He should like to say a few words about the appeal which they were compelled to make against the increased rating of the Company by the Board of Guardians. In the appeal the Directors were successful; and the fact that the Arbitrator charged almost the whole of the Company's costs on the Guardians showed what he thought of the case. It had been stated at a meeting of the Guardians that it was very unfair that small ratepayers should have to pay while great companies escaped nearly scot free. This only showed the extraordinary ignorance of the speaker; for if he had taken the trouble to refer, he would have found that the Company actually paid in local rates last year £2709. A good deal was made by the Guardians of the fact that an increased assessment of £400 only was offered to the Company; and it had been asserted that the Directors declined it. This, however, was not the case. In the first instance, the Guardians gave notice of an increased assessment to the extent of £675 in the early summer of last year, against which the Company naturally protested, because the Directors had argued, and they still argued, that they were already assessed in too large a sum. Then the Guardians offered to reduce it to £400; and this offer—he wished to emphasize this—was never refused by the Company, and would probably have been accepted, but, while they were considering the matter, they were surprised to receive a notice from the Guardians stating that they had decided to return to the original assessment pending arrangements they proposed to make for a valuation. The Directors, of course, did not complain of this. The next step taken was that the Guardians increased the Company's assessment, not by £400, but by £2328 on the £6790 at which it already stood. The Directors' experience of a similar appeal in 1896, in which the cost to the consumers and ratepayers was

upwards of £4000, made them most desirous, in the interests of both parties, of avoiding a repetition of such enormous expenditure. They, therefore, instructed their Solicitors to offer arbitration to settle the fair rateable value. No less than four separate and distinct offers in writing were made by the Company's Solicitors to the Guardians between May and December, 1897, all of which were declined. The Directors also requested the Guardians to hear their representatives with the view of showing the injustice of such an exorbitant increase, which would make a difference to the Company of over £1100 a year. The answer received was that the Guardians had resolved to rely on the valuation made by Messrs. Castle. Subsequently the Company's Solicitor waited personally on the Chairman of the Guardians, and offered on behalf of the Company, with the view to settlement, to submit to an increased rating of £400, both parties to bear their own costs. This offer was also declined, on the ground that Messrs. Castle had assured the Guardians that their increase of £2328 would be fully sustained. When these facts were made known to the public, the Directors felt they would be completely exonerated from the unjust attempts that had been made to place upon the Company the responsibility of the litigation which ought to be borne by the Guardians. The Chairman also congratulated the consumers and the town generally on the compromise effected with the Corporation in regard to the Bill now before Parliament (*ante*, p. 1015); and he concluded by moving the adoption of the report, which recommended the payment of the maximum dividends.

Mr. J. K. Simpson seconded the motion, which was carried.

The retiring Directors were re-elected; and the usual complimentary votes concluded the proceedings.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the London Offices, No. 30, Gracechurch Street, E.C.—Mr. Charles Gandon in the chair.

The Secretary (Mr. S. Wood, F.C.A.) read the notice convening the meeting; and the report and accounts were then presented.

The Chairman, in moving their adoption, expressed his regret that the results of the Company's operations during the six months ending Dec. 31 last did not enable the Directors to recommend the payment of any dividend. At the same time, he thought, when the report and accounts were compared with those for the preceding six months, there were signs of improvement in the Company's business. In the first place, there was an increase in the gas and meter rental, though not a large one—being only £84. The greater portion of this increase, however, was attributable to the private consumers; and this was a very satisfactory feature, for in the previous half year there was a falling off under this head. The receipts from residuals were £21 more, though less coal had been used. Turning to the other side of the accounts, it would be seen that coals had cost £57 less; and wages, trade and general charges, and bad debts were also reduced. On the other hand, salaries and rents, rates, taxes, and insurance were somewhat more, which was chiefly due to an adjustment of the insurance premiums. These were effected on a mutual principle, and so were not a fixed sum. The total expenditure was £2016, as against £1947 in the preceding half year. The receipts amounted to £2122, as against £2017. The balance to the credit of profit and loss account was therefore £106, as compared with £70 for the first half of 1897. This was not a large increase; but he had hopes that the Company would show better results for the current six months. Probably repairs would not cost so much as had been the case in the period under review; and besides this the allowance to their late Manager (Mr. T. B. Younger) ceased at the close of last year, which meant a saving to the Company of £360 per annum. Their present Manager wrote on March 31 saying that there seemed to be a prospect of an increase of business in the colony; and this opinion had to some extent since been confirmed by him. The Manager reported that he had secured a very good new consumer, which was an important matter to them. Certain improvements in working had been effected, which had resulted in an increase of 5 per cent. in the quantity of gas sent out. The unaccounted-for gas had at the same time been reduced somewhat, though the percentage was still large. He was afraid that no real improvement could yet be reported in the position of the colony. Trade still continued in a very depressed state; and so the Company could not at present look for much greater prosperity. At the previous meeting, he had said that he did not hold out any hopes of immediate improvement; and he wished to repeat this on the present occasion. He thought, however, the outlook was somewhat better.

Mr. Alfred Lass seconded the motion; and it was carried.

The retiring Director (Mr. R. Berridge) and Auditor (Mr. H. J. Hartley) were next re-elected.

The Chairman then proposed that the number of Directors should in future be limited to five. He said it would be remembered that at the last meeting it was his melancholy duty to announce the death of one of his colleagues, Captain Thurburn, which reduced the number of Directors to five – that was four in England and one in Georgetown. In their Act, five Directors was fixed as the minimum; and the Board thought that this number was sufficient to manage the Company's affairs.

Mr. Magnus Ohren seconded the motion; and it was agreed to.

Mr. H. J. Hartley, in proposing a vote of thanks to the Chairman and Directors, said he hoped more favourable times would come, and that the Board would not think they had lost the confidence of the shareholders.

Mr. Magnus Ohren seconded the motion, which was carried.

The Chairman, in returning thanks, said it was very depressing work for the Directors to carry on the business in the present condition of affairs; but they were pleased to know that they had the confidence of the shareholders.

The proceedings concluded with a vote of thanks to the Manager (Mr. D. F. Drayton), the Secretary, and other officials.

Gainsborough District Council and the Gas-Works.—The Gainsborough District Council have decided to purchase the undertaking of the Gainsborough Gas Company at the earliest opportunity; and for this purpose a purchase clause has been inserted in the Bill which is being promoted in Parliament by the Company.

THE SUPPLY OF WATER GAS BY THE LIVERPOOL GAS COMPANY.

Garston Again Protests.

The Garston District Council recently resolved to obtain an analysis of the gas supplied in the district, with the view of ascertaining the percentage of carbon monoxide therein. For this purpose, Messrs. Edward Davies and Son, of Chapel Street, Liverpool, were engaged; and at the meeting of the Council last Tuesday, their report was read. It stated that on April 5 they took a sample of the gas supplied to the Public Offices, Garston, at 3.55 p.m.; and it contained 23·6 per cent. of carbon monoxide. At 5.10 the same afternoon, they took a sample of gas in Banks Road, Garston; and it contained 23·2 per cent. of carbon monoxide. It was, they said, impossible to give the exact proportions of coal gas and carburetted water gas, as both varied in composition, unless they could analyze the coal gas and water gas before they were mixed; but if they took ordinary coal gas as containing 6 per cent. of carbon monoxide, and carburetted water gas 30 per cent., which seemed to be about a fair average, the Garston gas would be represented by a mixture of 75 per cent. of carburetted water gas and 25 per cent. of coal gas, which would probably be very nearly the proportions actually employed. After the reading of the letter, Captain Turner said the Medical Officer had been deputed to give evidence before the Home Office Committee on Water Gas; and he thought it would be well if they could strengthen his hands by giving him the opinion of the Council on the subject. Mr. Rigby, as Chairman of the Committee recently appointed by the Council to inquire into this question, proposed that they ought to send to the Gas Company the strongest possible protest. He considered that the conduct of the Company was disgraceful; and no language was too severe to characterize it. Mr. Rigby, in reply to the Chairman, said the Company gave them an honourable understanding that the proportion of water gas should not exceed 25 per cent.; and now by the analysis it appeared that they were supplying 75 per cent. It was decided to supply the Medical Officer with full information to submit to the Home Office Committee, and to send a strong letter of protest to the Gas Company.

THE SUPPLY OF COAL GAS AND WATER GAS BY THE BIRKENHEAD CORPORATION.

Reports by a Special Committee, the Gas Engineer, and Sir H. Roscoe.

In the "Journal" last week (p. 1024), it was briefly recorded that a Special Sub-Committee of the Birkenhead Corporation had presented a report on the subject of the manufacture and supply of carburetted water gas by the Corporation. We have since received from the Gas Engineer to the Corporation (Mr. T. O. Paterson, M.Inst.C.E.) a copy of the report, the principal portions of which are given below.

The Sub-Committee received their instructions under the following circumstances: At a meeting of the Gas, Water, and Electrical Committee held on the 8th of January last, an extract was read from the minutes of the proceedings of the Council of the 5th of that month referring to the Committee a petition from a number of ratepayers and residents in the borough, addressed to the Mayor and Corporation, with regard to the present gas supply, which, it is alleged, "is causing serious injury to health, badly-lighted streets and houses, and noxious smells, besides being otherwise objectionable." At the same meeting of the Committee, a letter was read from the late Mr. John Laird on the subject of water gas and gas generally; and it was resolved thereupon that a Sub-Committee be appointed to "take into consideration the subject of the quality of the coal gas and carburetted water gas manufactured by the Corporation gas-works, and the pressure of the gas supplied to the consumers; also to consider the petition from the ratepayers and the letter of Mr. John Laird in reference thereto, and to consider and report generally upon the subject," with power to obtain such special expert assistance and advice as they might think fit. The Sub-Committee held their first meeting on Jan. 13, and considered the matters referred to them.

As it appeared to the Sub-Committee that the petition from the ratepayers was so worded as to admit of any person signing it who had a complaint of any kind in reference to the gas supply, from whatever cause arising, they deemed it desirable to obtain some more definite statement of each individual cause of complaint. A printed circular was therefore sent to each of the signatories to the petition, requesting them to state under which of the following heads their complaint was made: (1) Want of illuminating power. (2) Want of pressure or insufficient supply. (3) What (if any) bad smell was complained of; when it was first experienced, and how often recurring. (4) What other objection or complaint had to be made.

Of the 241 persons who signed the petition, and to whom the circular was sent, 177 replied. In 129 of these cases the Gas Engineer had a special inspection of the premises made, in order if possible to remedy the defect complained of. In 38 cases the cause of complaint was remedied and the gas consumer satisfied; 51 gas consumers were satisfied without anything being done; and in 30 cases they remained dissatisfied. Of the eight replies received from medical practitioners, only one contained a complaint as to any effect on health. Of the replies received from other sections of the petitioners, four were in duplicate; one stated in reply that he was "well supplied, quite perfect, all he could wish just now;" another replied that he "did not accept Professor Lewes as an infallible authority, and that the public would hail with satisfaction the resignation of the Chairman of the Gas and Water, &c., Committee;" another "*did not use gas*, but complained of the dust receptacle and the state of the back passage;" one stated that "personally I have every confidence in Committee and officials doing their best for ratepayers generally;" while another one replied, "I have not the slightest confidence in the Gas Committee, for whom it is presumed the questions are asked." Three other replies were unsigned and without address.

With regard to the question of the want of illuminating power of the gas, the average reported by the Gas Engineer during the five years 1893-7 was: Maximum, 20·48 candles; minimum, 19·75 candles; average, 20·10 candles. The average reported by Messrs. A. Norman Tate

and Co., the independent analysts appointed by the Corporation to test and report monthly upon the quality of the gas from time to time supplied during those years, was 20·19 candles. The Sub-Committee remark that the illuminating power of the gas has been steadily maintained, and during the year 1897 was of a high quality, and more than equal to that of the previous four years, prior to the introduction of the admixture of carburetted water gas. Any complaint made in respect to the gas supply could not, therefore, be attributable to the want of illuminating power of the gas. The Sub-Committee draw attention to the fact that since the introduction of carburetted water gas the number of ordinary complaints from gas consumers has decreased in a most remarkable manner. During the year 1896, the number received amounted to 3914; during 1897—*i.e.*, since the introduction of water gas—it fell to 1539.

With respect to the reports periodically received from the police of the "number and situation of public street-lamps giving an insufficient light," the complaints have likewise been reduced in a marked degree; and during the month of February last, the Chief Constable stated that he had not received one report from the constables in any division. The naphthalene deposits in the service-pipes have hitherto been to a large extent the cause of the foregoing complaints. Since the introduction of carburetted water gas, these deposits have ceased to be formed; and the Sub-Committee say it is therefore evident that the mixture of gas at present supplied "has disposed of one of the most serious and troublesome obstacles in the gas supply of large towns."

With regard to the question of the "want of pressure or insufficient supply" of the gas, the Sub-Committee say this is a matter with respect to the effective distribution of the gas which it is somewhat difficult to provide for and to estimate in a district like Birkenhead, the suburban sections of which have during the past ten years experienced an unusually rapid development. The subject of the extension of the gas-mains and the replacing of old mains by pipes of much larger internal area, and the laying of new mains as feeders, has from time to time received the most careful attention of the Committee and the Gas Engineer; and large outlays of money have been sanctioned in reference to this particular class of work in various parts of the town and district of supply. Further works of the kind are under consideration; and the Gas Engineer will from time to time submit his recommendations as to what renewals and extensions may be required in order to meet the growing demands of the various districts within the area of supply.

With regard to the question of the "bad smell," and from what cause arising, the Sub-Committee say the replies of the petitioners to the queries submitted to them furnish very conflicting data upon which to base inquiries. One refers to "bad smells from the sewers;" another states "bad smells, the gas blamed." After giving this part of the question their most serious consideration, the Sub-Committee formed the opinion that wherever any noxious gas or vapour was emitted, and a bad smell was complained of, it appeared to be conveniently attributed to the gas supply.

As to the "other objections or complaints" of the petitioners, they appeared to have reference chiefly to blackened ceilings, caused by the unconsumed carbon given off by the gas-flame from a gas of a high illuminating power not efficiently consumed at the burner. The Sub-Committee point out that the remedy for this is efficient combustion by the use of suitable burners, and regulating the supply so that the gas does not blow at the burner, and pass off only partially consumed. Where incandescent burners are in use, the mantles ought, they say, to be carefully removed, and the perforations in the burner beneath the metal cap, through which the gas passes to the mantle, periodically cleaned and freed from ordinary dust accumulations, and from fragments of the mantle which in falling may obstruct the passage of the gas.

The question as to whether or not the products of combustion of carburetted water gas are injurious to health, or more so than those from ordinary coal gas, is one upon which the Sub-Committee do not offer an opinion. The special report of Sir Henry Roscoe, prepared by him at the request of the Sub-Committee, sets forth his views upon this question; and the definite opinion expressed by him that "the products of combustion of carburetted water gas are not more injurious to health than are those of coal gas," the Sub-Committee think ought to be convincing to every unprejudiced person. The Sub-Committee also refer to the following question and answer contained in a special report by Professor Vivian B. Lewes, F.I.C., &c., made to the Gas Committee in March, 1897*: "Is carburetted water gas a cumulative poison—*i.e.*, can it be inhaled in small quantities and retained in the system day by day until health is undermined?" "In the continuous breathing of small percentages of carbon monoxide, this might be the case; but if there is any change of *locale* it would be practically impossible. A person sleeping in a room with a leaky gas-fitting might each night take into his system a small trace of the gas; but in his outdoor life in the daytime this trace would be eliminated, so that unless confined to one apartment for a very long period, no such action would be likely to happen. In my experience, men exposed to this gas, in working producers, &c., soon get used to its effects, and show no loss in health."

The Sub-Committee suggest that, after the consideration and adoption of their report and its appendices by the Gas Committee and the Council, copies should be furnished to the Departmental Committee appointed by the Home Secretary to investigate the subject of carburetted water gas, with an intimation that, if desired, the Gas Engineer of the Corporation would appear before them in support of the views set forth therein, and generally as to the manufacture and supply of the gas in Birkenhead.

In conclusion, the Sub-Committee repeat and endorse the statement contained in the concluding paragraph of the special report of the Gas Engineer, dated Jan. 20, 1897, as follows: "If the mixture of coal gas and carburetted water gas now supplied to the gas consumers in this town is distributed and consumed with the same care and attention to pipes and fittings as has been given in the past when coal gas only was supplied, there can be no reasonable or valid objection to the supply and use of a mixture of carburetted water gas and coal gas, which is equally as suitable and effective for all domestic and trade purposes as coal gas alone."

The report is followed by two appendices. The first is a report by the Gas Engineer on the charges contained in the petition. Mr. Paterson says that 177 replies were received to the 241 questions sent out. On examining the returns, it was found that there were 129 complaints of illuminating power, 31 of pressure, 110 of bad smells (65 inside and 79 outside of premises), and 85 complainants objected to carburetted water gas. It was then decided that, in all cases where the illuminating power or pressure was in question, a special inspection should be made of the premises, and as far as possible the defect remedied. When this was done, out of the total number of complainants, 89 were satisfied with the illuminating power, 51 of whom stated that the quality of the gas was at fault when they signed the petition, but was afterwards satisfactory; 38 were satisfied after the men had remedied the defects; 30 remained dissatisfied; to 7 Mr. Paterson suggested remedies in the fittings, &c.; 2 refused admission to the fitters to examine; and 1 discontinued the use of gas. Viewing the above, he considers that no very grave charge against the gas as an illuminant is suggested, notwithstanding the 30 dissentients, as some of these were automatic consumers, who complained of not getting enough light for 1d. Having dealt with the question of pressure, Mr. Paterson comes to the complaints of the eight medical men. On inspection of the premises, it was found that in two cases there was a stoppage in the service-pipe, which was remedied, one meter was too small, one had defective fittings throughout the house, one had too small a pipe from the meter, and three had no complaint to make as to the gas now being supplied. One, however, still objected to the use of carburetted water gas. Passing on to the complaints of bad smells, Mr. Paterson says the residences of the complainers of smells in the streets are nearly exclusively situated on the west and north of the gas-works. With regard to the smell said to emanate from the sewers, he says there may have been grounds for some complaint on this head some months ago, as water from the washer was at times passed into them; but this has long since been discontinued, and the drain-pipe plugged up. A further source of complaint was of the fumes passing from the carburetted water-gas house from time to time. Though these alleged smells have never been evident to Mr. Paterson (more than an ordinary gas-works smell), certain alterations have been made to prevent any oil vapour from leaving the plant, and so far with satisfactory results. In short, there is absolutely no cause of complaint from the sewers; and he believes there is no smell from the carburetted water-gas plant. One of the petitioners wrote: "Very bad smell at times; Sunday night last very bad." Mr. Paterson looked into the matter, and found that the carburetted water-gas plant was stopped the whole of the day referred to, from 6 a.m. on the Sunday to 6 a.m. on the Monday. With regard to the inside complaints—which comprised "very dirty blackened ceilings; smell from burning gas causing oppressive feeling and headache; peculiar stuffy smell; a drowsy, tired feeling, due to the bad atmosphere; cooking-stoves smelling, and doing less work; destruction of incandescent mantles; mantles do not last one-third the time they did; gas-fires smell at times when lighted; and gas only smells after it is turned off"—Mr. Paterson expresses the strong belief that had the queries touching on the interior lighting been sent out before the introduction of carburetted water gas, the answers returned would have been very similar to those of to-day. He says: "'Blackened ceilings' is a general complaint. This is largely due to unconsumed carbon; and the higher the illuminating power the greater the liability of smoky flames, with the inevitable result of blackened ceilings. Poor qualities of gas—15 to 17 candle—do not contain the same percentage of hydrocarbons; therefore incomplete combustion is less liable than in the case of denser or richer gas. Too small pipes, bad burners, stoppages in taps and arms of chandeliers, &c., are all conducive to smoky flames, especially so in high qualities of gas. Badly-ventilated rooms suffer most in respect of blackened ceilings, as the upper portion of the room becomes so hot that, after the lights are extinguished, a rapid process of cooling commences, and the water vapour formed carries with it the dust floating in the room; and each succeeding night it lays down a fine coating on the wall and ceilings. Of course, the process of discoloration is slow if the room is of reasonable dimensions, and especially so if the gas is being consumed as it ought to be. A smell while the gas is burning is also a common complaint, and I attribute that to some portions of the hydrocarbons having passed partially consumed, and to the ordinary products of combustion of the gas, which are chiefly water vapour and carbonic acid, due to the hydrogen combining with the oxygen of the air forming water, and the carbon combining with the oxygen forming carbonic acid; and I again state that where ordinary care is exercised in consuming the gas in a fairly ventilated room, there should be no more trouble now than at any period previous to the supply of carburetted water gas, as there is practically no difference in the products of combustion." Coming to the remaining points in the petition—viz., injury to health and street lighting—Mr. Paterson advises the Sub-Committee, with regard to the former, to consider the advisability of obtaining independent testimony. In the face of a statement he received a short time ago from a doctor in the town: "In my opinion, the present gas is a slow poison," he says it appears absolutely necessary to obtain the strongest independent evidence possible upon this particular question. He points out that there are now 41 towns in the United Kingdom where carburetted water gas is manufactured; and in nine of these the plant has been doubled, and in one case trebled, in capacity. He has received from 22 of these towns replies to his inquiries as to whether complaints had been received as to the supply of this gas. Of these replies, three had given offence by allowing the waste water to enter the drains, one by burning the tar under the boilers, one by a smell from the stack-valve, and the remaining seventeen had received no complaints whatever. The question of street lighting is one that rests with the Watch Committee. The lamps are placed according to their instructions; and the consumption of gas is in accordance with the rate agreed upon and paid for. Appended to the report are tabulated and other statements directly bearing upon the questions referred to therein, and affording the Sub-Committee valuable information. One is an extract from the "JOURNAL" for Jan. 11 last on the subject of "Lighting a Hospital by Water Gas;" and another consists of excerpts from the report of the Committee appointed by the Board of Trade to inquire into the system of ventilation employed for the tunnels of the Metropolitan Railway - giving the views of Dr. Haldane and Mr. John Bell.

The second appendix is the report of Sir H. Roscoe referred to by the Sub-Committee. It is as follows:—

Gentlemen,—During the past ten years I have given considerable

* See "JOURNAL," Vol. LXIX., p. 846.

attention to the question of the manufacture and distribution of carburetted water gas. Not only have I personally visited and inspected most of the water-gas plants in operation both in England and on the Continent, but my Chief Scientific Assistant—Mr. Frank Scudder, F.I.C.—has visited the principal cities of America where carburetted water gas is manufactured and distributed to the consumer; and he has reported to me the results of his visit. The statistics which I have therefore been able to collect have enabled me to form an independent opinion as to the value of carburetted water gas as a substitute for, and as an adjunct to coal gas, and especially as to the effects produced in its distribution. The presence of a large proportion of carbonic oxide in carburetted water gas has led to the contention that such gas is objectionable and dangerous, even when mixed with coal gas; and it is upon this portion of the question that I am now requested to give an opinion.

The proportion of carbonic oxide in water gas, which by itself burns with a non-luminous flame, is about 39 per cent. by volume. Gas of this quality has been used with safety, both for heating purposes and as an illuminant, in private houses in America. To a less extent this gas has been used on the Continent, but with equally safe results. In England, the gas has only been used to a limited extent for lighting purposes. In order to render the flame luminous, it is necessary to impregnate the gas with the vapours of volatile hydrocarbons; and it is then called "carburetted water-gas." This contains about 29 per cent. of carbonic oxide, and constitutes a very large proportion of all the gas made in America; and many gas-works in England are now mixing it with coal gas. Coal and cannel gas (Birkenhead) contains from 5 to 6 per cent. of carbonic oxide.

The diversity of opinion which has been expressed as to the effect of carbonic oxide contained in varying quantities in these gases upon the life of human beings is considerable. The old Boston (U.S.A.) Gas Company succeeded in obtaining the passing of a law prohibiting in the State of Massachusetts the manufacture and sale of gas containing more than 10 per cent. of carbonic oxide. Litigation of an energetic character went on for years; and 223 Boston doctors signed their names to a declaration "that water gas is no more dangerous to health and life than coal gas, and there is no just ground, so far as health and life are concerned, to prohibit its manufacture." The law was subsequently repealed by Governor Brackett; and water gas can be, and is now, made in Massachusetts without any restriction whatsoever. Eminent chemists, both in the United States and in Europe, have testified to the non-dangerous character of carburetted watergas.

Too much weight ought not to be placed upon statistics relating to the number of deaths from inhaling illuminating gas, without discriminating between those attributable to the action of water gas on the one hand and coal gas on the other, or to cases where death has been caused by suicide or drunkenness. Moreover, there exist in coal gas and in carburetted water gas other gases to which the illuminating power is due. These condensable hydrocarbons ("illuminants" as they are called) possess deleterious properties; and though we know very little respecting their influence on the harmful action of gas when breathed, yet the danger to life by reason of rapid insensibility, such as that which is produced when a workman is "gassed" with ordinary coal gas, is well known. I am therefore not at all satisfied that, by restricting the percentage of carbonic oxide in town gas, accidents can be altogether avoided.

With the object of estimating the amount of carbonic oxide in the gas supplied to various parts of the town of Birkenhead, I sent my assistant, Mr. Scudder, on the 24th of March, to make experiments. The following results (percentages by volume) were obtained:—

Place.	Carbonic Acid.	Condensable Hydro-carbons.	Carbonic Oxide.	Hydrogen.
Birkenhead.				
Yates' Brewery, 18, Market Street	1·3	5·8	12·1	45·6
Old Post Office, 95, Argyle Street	1·6	6 0	12·2	..
Manor Arms, Chester Street	1·6	6·2	12·0	..
Graving Dock Hotel, North	1·6	5·9	10·3	..
Royal Rock Hotel, Rock Ferry, South	1·6	6·1	10·3	47·3
Manchester.				
Sir H. Roscoe's Laboratory, 44, Mosley Street.	2·0	7·0	12·8	45·0
	2·1	6·8	11·3	46·2

From these results, I have calculated that the Birkenhead gas supply contained from 26 to 27 per cent. by volume of carburetted water gas.

Carbonic oxide is not a cumulative poison; and it is a well-known fact that workmen who are temporarily exposed to this gas, and are often affected, recover, and show no loss of health.

The products of combustion of carburetted water gas are not more injurious to health than are those of coal gas. If perfect combustion of the gases takes place, the products are the same, and the effects on health are the same; and the proportion of carbonic acid produced by the combustion of carburetted water gas is much less than that produced by the same volume of coal gas.

The Wath-upon-Dearne Water-Works Purchase.—At last Tuesday's meeting of the Wath District Council, Mr. Hallatt announced that the Committee who were dealing with the water question had been successful in arriving at an amicable settlement with the Water Company in regard to the purchase of their undertaking. There was, however, the inevitable opposition to the Council's Bill from the Dearne Valley Water Company, Earl Fitzwilliam, and the Rural Authority of Rotherham; and the fight in these cases would be in Committee. But he had very good faith that they would be able to beat all three. The Company had undertaken, at a given time, to withdraw their opposition in Parliament; but, this would not be done until the Bill came before the Committee. Although the contract was not actually signed, there was no fear but what they had arrived at an amicable agreement. From first to last, the Committee had been acting absolutely on the advice of their legal advisers, in whom they had unbounded faith.

MANCHESTER GAS COMMITTEE AND THE PRICE OF GAS.

Reduction for the Out-Townships—Concession to Prepayment Consumers.

At the Meeting of the Manchester City Council last Wednesday, the following resolution of the Gas Committee was discussed: "That it be a recommendation to the Council to reduce the price of gas to the out-townships of Manchester to 2s. 6d. per 1000 cubic feet, to abolish the charge for meter-rents, and, with regard to the penny-in-the-slot meters, to supply 30 cubic feet of gas for a penny, instead of 25 cubic feet as at present, as and from Sept. 29, 1898."

The Lord Mayor (Alderman Gibson), who is Chairman of the Committee, moved the adoption of the resolution. He asked the Council to agree to the propositions, first, because he thought them fair and equitable; and, secondly, because it was expedient that they should do so. In 1860, he said, the charge for gas was 4s. 6d. per 1000 cubic feet to the citizens; and to the residents in the out-townships it was 5s. If it was just and fair to charge a differential rate of 10 per cent. to the out-townships forty years ago, certainly it could not be just and fair to charge 22 per cent. and 44 per cent. as they were now doing. The present price of gas within the city was 2s. 3d. per 1000 cubic feet, and no meter-rent was charged. The price to the near out-townships was 2s. 9d., or 22 per cent. above the city price, and meter-rent was charged—that was to say, a resident in the near out-townships paid 24s. 6d. for what a citizen obtained for 20s. The present price of gas to the remote out-townships was 3s. 3d., or 44 per cent. above the city price, and meter-rent was charged—that was, a resident in the remote out-townships paid 29s. for what a citizen obtained for 20s. The proposal of the Committee, the Lord Mayor explained, would in the matter of the abolition of meter-rents mean an annual loss in revenue of about £3200, and the reduction in the price of gas in all the townships represented an annual loss of revenue of about £7000; making a total of £10,200. What the Committee proposed was simply to charge a universal differential rate of 10 per cent., just as they did 38 years ago. He was perfectly satisfied that it was right the out-townships should pay a differential rate; but he thought 2s. for every sovereign was as much as they were justified in charging them. He was of opinion that, if these reductions were made, the consumption of gas in the out-townships would be enormously and rapidly increased. This, indeed, was their universal experience. In 1895, the Council gave away, by a stroke of the pen, £30,000 a year out of their gas profits, when they reduced the price of gas 3d. all round and abolished the charge for meter-rents, for which they were getting £14,000 a year. What happened? In 1896 the revenue fell below that of 1895 by the sum of £46,000; in 1897, it had so far recouped that it was only £5000 less; and in 1898, the revenue was more than £2000 in excess of what it was in 1895. As a matter of fact, the Council had never made a reduction in the price of gas which had not recouped itself in three years. He wished to remind the Council that they took off the £30,000 in face of the commencement of the electric light undertaking; and yet they recouped themselves and increased their revenue in spite of the opposition of the electric light, and of the fact that this undertaking had enormously and unexpectedly advanced. He was the last man in the world to fear the legitimate competition of the electric light; but the Gas Committee would be taking a narrow view of their duty if they failed to recognize that it would be a very powerful competitor indeed. Unless they sold the commodity which they manufactured at as reasonable and low a price as they could possibly afford to sell it, they would find the electric light undertaking a very much more powerful competitor than they anticipated; and in a short time they would find themselves also with a much smaller number of customers. He was asking the Council to do a reasonable thing. As to the prepayment-meter supply, some time ago he practically made a pledge that at the earliest opportunity the question of a reduction should be considered by the Committee. They had come to the conclusion that they might now consistently agree to give 30 cubic feet of gas for a penny, instead of 25 feet. This meant a loss to the undertaking of something like £3000 a year, and that was again exclusive of an expenditure of about £2000 which it would cost to alter the slot meters that were already in use. He asked the Council to pursue a progressive policy, which would be to the interest not only of the gas consumers, but to that of the community generally.

Mr. Briggs seconded the motion.

Mr. Hampson, speaking of the proposed concession to prepayment consumers, said that coal was a fluctuating commodity; and there was every indication that it would become dearer. In this case, if they altered the meters, there was every probability they might have to change them back again. The proper course, he thought, would be to make a reduction to the prepayment consumers of something like a penny in the shilling, which would make a difference equivalent to that which it was now proposed to give them, without the cost being incurred of any alteration in the meters. He believed the increase in the consumption of gas had been due to the fact that in the last few years the price of mineral oil had substantially risen. He objected to giving further concessions to the residents in the out-townships; and he thought the Council would make a great blunder and would stultify themselves if they sacrificed what had hitherto brought them in £15,000 a year. He did not think the adoption of the proposals of the Committee would increase the consumption of gas.

The Lord Mayor said the suggestion of Mr. Hampson with reference to making a rebate to prepayment consumers, instead of altering the meters deserved, and would receive, consideration by the Gas Committee.

Mr. Hampson (proceeding) supported the proposal to abolish meter-rentals in the out-townships, but considered that the suggested reduction in the price of gas was, at the present time, inopportune.

The Lord Mayor said he had "thrown down the gauntlet," and should not take it up again. The present was the third time he had brought the matter before the Council for consideration; and they must decide it that day.

After further discussion, it was agreed to take the Committee's proposals *seriatim*.

The Lord Mayor then moved that the price of gas charged to consumers in the out-districts be reduced to 2s. 6d. per 1000 cubic feet.

Mr. Briggs seconded the motion.

Mr. Hampson moved as an amendment, and Mr. Pollitt seconded, that the price remain as heretofore.

The Lord Mayor ruled that this was not an amendment but a negative.

Upon the resolution being submitted, 44 voted for it, and 27 against it.

The Lord Mayor then moved that the charge for meter-rents in the out-townships be abolished.

Mr. Lambert seconded the resolution, which was carried.

The proposal to increase the quantity of gas given for one penny through prepayment meters from 25 cubic feet to 30 feet was also agreed to; the reduction applying to the city only.

THE APPLICATION OF GAS AND WATER PROFITS TO THE RATES AT LEEDS.

The old question of the application of gas and water profits to the relief of the rates has been much discussed at Leeds during the past week, owing to a proposal of the Finance Committee to take £9000 from the Gas Department and a similar sum from the Water Department. When the matter came before the Gas Committee, a resolution was moved to the effect that the request of the Finance Committee be acceded to; but an effort was made to pass an amendment recommending a reduction of 1d. per 1000 cubic feet in the price of gas. A long debate ensued; but it seems to have run entirely on party lines. The Conservatives, it is stated, urged that the profits were due to their genius as administrators; that the make of gas had increased some 2000 cubic feet per ton of coal carbonized since they took office; that the price of gas was not at present excessive; that the gas consumer obtained good value for his money; that it would be foolish to advance the rates when the Corporation had these surpluses at their disposal; that fluctuations in rates were unwise; and that, with smart financing and wise and careful administration, such fluctuations were unnecessary. On the other hand, it was contended that the Corporation did not become possessed of the gas-works for the purpose of making profits, but with the object of placing it within the reach of every householder to obtain good gas at cost price; that all ratepayers did not consume gas; and that it was unjust to charge those who did consume it more than it cost, merely in order to obtain a balance to share among those who did not contribute a penny piece to the maintenance of the gas-works, but used the electric light or burned candles; that this method of making up deficiencies in other departments with gas profits would not tend to induce those departments to keep within their estimates; that in past years, under Liberal administration, when it was found that gas could not be made to retail to the consumer at 1s. 10d. per 1000 cubic feet, the price of the gas was raised; that if the present price yielded more than sufficient to cover the cost, the consumer ought, in justice, to have the benefit of it; and, finally, that the financing of the Tory party was bad, unprincipled, and deceptive. After these and similar arguments had been put forth, the vote was taken, and resulted in five members declaring in favour of the amendment, and nine for the original motion. At the meeting of the Water Committee, a similar resolution was passed by eight votes to five.

At the meeting of the City Council on Wednesday, in presenting the estimates of the Finance Committee, and a proposal to levy a city rate of 2s. 2d. in the pound, Alderman Gordon referred to the proposal to take £9000 each from the Gas and Water Committees. He said in March, 1897, the Gas Department had a surplus of £19,000; while the Water Department had £16,000 in hand. The profits made by the two Committees since March, 1897, would, in the opinion of the Chairmen, be more than the £9000 asked for; so that the old surpluses would not be reduced. The practice, he pointed out, of taking money from Committee profits had been followed by the present Council's predecessors—the Liberals. Before the Conservatives came into office, gas profits were taken in aid to the extent of £47,840, while losses on the gas concern were met from the rates to the extent of £5116; and the same thing had been done with regard to the water-works. This money, the Alderman observed, was asked for in order to keep the rates at their present figure. The Committee believed the rates should be kept steady; and they felt certain the ratepayers preferred it so. The alternative would be to recommend the raising of the rates. In the course of the discussion, Mr. Henry protested against taking gas and water profits in relief of the rates—advancing the argument that the gas consumer and the ratepayer were not the same individual. Mr. Brown joined in the protest, and stated (amid laughter) that he had it from the Chairman of the Water Committee that, when he was approached for the £9000, he replied with a most vehement letter. The Committee's proposal was supported by Mr. John Simpson, who hoped the Gas Committee would not be content with contributing £9000 a year in relief of the rates. In his opinion, they would be doing a great service to the city when they were able to realize sufficient to cover the whole cost of the Lamp Department, which was about £28,000 a year. Moreover, if the Water Committee, after providing for a cash balance of (say) £10,000, handed over the remainder, they would be doing a graceful thing. He also quoted figures to show that, if the rates were raised 1d. some of the ratepayers would pay more than they would if 1d. per 1000 cubic feet were taken off the price of gas. He pointed out that 75 per cent. of the gas consumers used only 25 per cent. of the gas sold. Alderman Cooke, the Chairman of the Water Committee, admitted that, when he was asked for the £9000, he did write a vehement letter. But he was not insensible to the fact that, in the event of the money not being granted by the Water and Gas Committees, a large body of shopkeepers would have to pay an increased rate; and after hearing a statement of the case, he expressed his willingness to hand over the money. Last year they gave £18,000 to the Finance Committee; this year they proposed to give £9000, and then they would not be "stumped." They had in hand £16,000 of a previous balance, in addition to this year's profits, which he had reason to assume would not be any less than last year, when they were about £12,000. He strongly objected to these matters being fought on political lines. Mr. Clarke contended that there was no reason why they should give the profits on the gas undertaking to the consumers. It would not be the working classes, but the large consumers, who would benefit by a reduction of price. Mr. Tetley was opposed to indirect taxation, and urged that the gas-works should be carried on as a business undertaking, and that the profits should not be taken in relief of the rates. Alderman Harland reminded the Council that they had taken water and gas profits in relief of rates in the past. Mr. Lowden, the Chairman of the Gas Committee, submitted that profits on municipal undertakings, after making certain necessary provision, should be for the benefit of the community at large. These undertakings were carried on not for the good of a particular section of the community, but for the good of the whole city. Birmingham, Glasgow, and other cities had been able, by the management of their municipal undertakings to devote surpluses to the reduction of the rates. It was possible that coal gas as an illuminant might be superseded; and it might be that a great portion of the outlay of 1¼ millions on the gas-works might become unproductive and unremunerative. If this should happen, it was not the gas consumer but the ratepayer who would have to bear the loss. The Town Clerk (Mr. Harrison), on being appealed to, said there was no doubt that according to Acts of Parliament all moneys received on gas and water account should be paid into the city fund, and all payments made on those accounts taken out of the city fund; so that there could be no such thing as transferring profits to the city fund—they were there already. Other speakers were both for and against the proposal. Alderman Gordon, in replying, said there had been on the part of certain members a deliberate attempt to force the Council to raise the rates. This was not the time, following a disastrous strike from which not only masters but workmen had suffered, to adopt such a course. He asserted that the Radicals had taken from the gas and water undertakings in aid of the rates no less than £154,000; while if the present proposal were adopted, the Conservative majority would have had £54,000. The motion to levy a city rate of 2s. 2d. in the pound was then adopted.

WIGAN CORPORATION GAS SUPPLY.

Last Year's Profits—Reduction in Price.

At the Monthly Meeting of the Wigan County Council last Wednesday, the accounts and certain recommendations of the Gas and Electric Lighting Committee were subjected to considerable criticism by two or three of the members.

Alderman Holmes, in moving the adoption of the minutes of the Committee, said the net profit for the past financial year was £11,281, out of which £10,300 had been handed over to the general district rate fund. He wished particularly to call attention to the reduction in the price of gas within the mile radius of the gas-works. The members would remember that some years ago the price within the mile radius was 3s. per 1000 cubic feet, and outside the mile radius 3s. 6d. This was raised at a time when it was absolutely necessary. In the out-townships, the price was reduced some three years ago within the mile radius from 3s. 2d.—a penny each time; and now the Committee were of opinion that it should be again reduced. This recommendation came from the Gas Committee in consideration of the understanding that, as soon as circumstances would permit, the price should be reduced to the figure from which it had been raised. Regarding the question of electric lighting, he stated that in the district in which it was proposed to supply current there were 69 in favour of the installation, but only 61 would undertake to use the current. There were 85 not in favour; and 60 did not even reply to the Committee's inquiries. However, the Committee considered that, in view of the notices that had been given to the Corporation from time to time, it would be necessary that the electric installation should be laid down by the Corporation. The Committee did not expect that for some years to come it would be a financial success; still they felt that, rather than let someone else step in, they should proceed with it themselves. The Council were recommended to appoint a Sub-Committee with instructions to make further inquiries into the subject of electricity generally.

Alderman Hilton seconded the motion.

Mr. Worthington said the first question he wished to deal with in connection with the accounts was the charge to revenue of new meters. He thought at one time that these were for the purpose of taking the place of the old ones; and he had been assured on more than one occasion that all the meters required for supplying new customers were charged to capital account. A return for which he had asked was rather startling. He found that since 1894, they had purchased 2009 meters, 1288 of which had already taken the place of old ones. The cost was £3342 16s. 8d.; and consequently there would be £2142 to be charged to the new meter capital account, and £1200 that really ought to be charged, as he took it, against revenue. In the minutes, he noticed there was an account by which the capital was to be credited with £150 against revenue on account of meters. If there was anything he disliked it was underhand work; and there was not a single minute authorizing any part of the revenue to be transferred to capital on that account. How it had got there he did not know; but he hoped, in dealing with these figures and accounts, they would go on some method which would be straightforward and understandable. The resolution concerning the reduction in the price of gas was one benefiting a large portion of Ince, and a fair portion of Wigan, and yet was of no advantage to a portion of Wigan. Everybody did not live within the mile radius of the works, which was the part affected by the reduction.

Alderman Lamb said he found from a comparison of 1897 and 1898 that the gross profits were very much the same. In 1897 they were £24,298; and in 1898, £24,577. But the net balance of profits for 1897 was £9698, and for 1898, £11,281. He found that the bulk of the difference was made up in the reduced charge payable in 1898 as interest on the sinking fund. With regard to the reduction in the price of gas, he said that a penny reduction represented £1300 a year; and practically meant a rate of 2d. There was also another point. The Corporation treated themselves as they did any other outside consumer. In the estimates for the rate, they had set aside £3800 for gas for the street-lamps. He asked whether it was good or bad policy that they should charge themselves in this way, merely for the purpose of making the department look satisfactory.

Mr. Fyans also considered that the present system of debiting the departments of the Corporation with the ordinary charge for gas consumed by them was an absurdity. At the same time, he saw that, if only £7000 was handed over to the relief of the rates instead of £10,000, the ratepayers would want to know the reason for the difference. Unless the change was made with much thought and care, there would be considerable misapprehension.

Mr. Ashton was in favour of a penny reduction in the price of gas. In

the next financial year, only nine months would be affected by the reduction; and the Committee expected the amount in hand would cover it.

The Mayor (Alderman Richards) had an idea that the price of coal was going to rise; and it therefore behoved them to consider whether or not they were following a right policy in taking the penny off the charge for gas. He did not wish to move any amendment; but after the experience they had had on a previous occasion he wished to express his views on the subject. They had already received two applications from out-townships to lower the price of gas; and they would say that, as the price had been reduced in Wigan, it should be reduced for them also. His idea was that for the present year the price might very well remain as it was.

Mr. Smith suggested that the resolution as to the price of gas should be amended.

The Town Clerk proposed that it should read that the price of gas be reduced to 3s. per 1000 cubic feet to the inhabitants of the borough and to those outside within the mile radius.

Alderman Holmes agreed to the alteration, as this was really the intention of the Committee. It had always been understood that, in speaking of the mile radius, they were speaking of one price for that and the whole borough as well.

The resolution was accordingly amended.

Alderman Holmes, referring to Alderman Lamb's remarks as to free gas for public lighting, said he did not see any objection to it. But it must be remembered that they had a department and a Manager; and it was right and reasonable that he should like to show what he was doing for the borough. Replying to Mr. Worthington, he said that the meters they had in stock at the present time were wet ones, and old stock.

Mr. Worthington: Is it a fact that you have not charged them to the revenue account?

Mr. Holmes said it was. They were charged to capital account; and there was a sum voted every year in respect of them from revenue to capital. This, in the Engineer's opinion, was a fair practice.

The minutes were then passed, with the exception of those referring to the electric light, which were withdrawn.

LINCOLN GAS AND WATER ACCOUNTS.

Increase in Revenue—The Division of Surplus Gas Profits between Consumers and Ratepayers.

The financial statements of the Gas and Water Departments for the year ending March 25 were laid before the members of the Lincoln City Council at their meeting last Tuesday.

Alderman Page, in moving the adoption of the minutes of the Gas Committee, said the capital account stood at exactly the same amount that it had for the last nine or ten years, although a largely increased volume of work had been done, and there had been a considerable increase in the mileage of mains. Ten years ago they carbonized about 17,000 tons of coal; but the quantity was now between 25,000 and 26,000 tons. He believed the mileage of mains in that period had increased from 38 to something like 45. It was only fair to say that they were nearly approaching a time when probably the demands of the city would require something in the nature of capital expenditure. They could not go on at the rate they had been doing without increasing the producing power; and certainly, if the city grew, in another two years some capital expenditure would have to be incurred. With reference to the revenue account, they had had a bad year, owing to the climatic conditions of the past winter. In 1896-7, they had an increase of about 8 million cubic feet in the quantity of gas consumed; but this rate had not been maintained—in fact, it had decreased to 8¼ millions. Although this was a satisfactory increase, it was not an increase at the same rapid rate as previously. The increased demand had necessitated the purchase of an additional 500 tons of coal. As to the number of consumers, they had 349 more than a year ago. The receipts had increased by something like £1113; the gross receipts having been £36,557, as compared with £35,444. This was satisfactory, because the price of gas during the past year had only been 2s. 3d. per 1000 cubic feet, whereas in the preceding year one-third of the gas was sold at 2s. 4d. The increase was even more satisfactory because they had not been able to get the same returns from the residuals. Tar alone had gone down from 25s. to 18s. a ton; and their receipts from this product were £122 less. They were hoping that they had now reached a price which was not likely to fall, as they had new customers in the market—one of the best being a large Railway Company, who used tar as fuel for their locomotives, as it could be obtained at a price which enabled them to compete successfully with coal. The sulphate of ammonia plant had been a great success; and there had been a rising tendency in this product during the last few months. They had obtained £280 more under this head than a year ago; and the expenditure on the plant had saved the Corporation something like £250 or £300 a year—being the difference between the profit on the manufactured sulphate of ammonia and the price obtainable for the ammoniacal liquor. This was a large and, it seemed to him, a satisfactory increase. One other item of increase was the interest on the reserve fund, in which they had now £15,000. The interest this year was £431, against £360; and they had raised the fund to £17,000. Coming to the result of the year's working, he said they had a sum in advance of the previous year of something like £643, arising from the fact that they had a margin between the receipts and payments of £12,346 this year, against £11,689 the preceding year. The interest on the stock and the sinking fund, was in round figures £8000. They put down £200 for the depreciation of gas cookers, which reduced the balance by £8204; leaving an available sum of £4141 to be dealt with, compared with £3497 last year. Then came the important point—how did they propose to deal with the surplus? The main question was what was to be the price of the 26,000 tons of coal required. Last year they had to pay 3d. per ton in excess of the price of the preceding year; and but for the fortunate circumstance that they were enabled to obtain a most favourable rate from the Railway Company, they would have materially suffered. As it was, the price came to about the same. He was inclined to think there might be some increase in the ensuing year. The coming into operation of the Workmen's Compensation Act in July might strongly induce the coalowners to take the opportunity of raising their price; but he thought it was a risk which, within reasonable limits, they could afford to leave alone, having regard to the surplus they had. The question then was as to the disposal of the surplus; and his view was that they should divide it between the consumers and the ratepayers. The Committee did not propose to part with the whole of the £4000. They must have some working capital; and therefore they kept £1000 in the concern. Substantially they proposed to divide the remaining £3000 by making a contribution of £1500 to the public coffers; and in reducing the price from Sept. 29 next to 2s. 1d. per 1000 cubic feet. This would take from the undertaking during the current year an estimated sum of £1500, and in future years of £2000 or £2100. On the whole, the year had been a very successful one—satisfactory alike to their Manager (Mr. J. Carter) and to the Corporation.

Mr. Bainbridge seconded the motion.

The Mayor (Mr. H. Wyatt) did not think they ought to let the resolution pass without some recognition. Personally, he was obliged to the Chairman and Gas Committee for the manner in which they had conducted the undertaking; and every credit was due to Mr. Carter. He thought the proposal to divide the profit equally between the ratepayers and the consumers was very fair, and one which would give satisfaction all round.

The minutes were adopted.

The minutes of the Water Committee set forth that the quantity of water pumped during the year was 464,108,400 gallons—an increase on the previous year of 18,292,320 gallons. The receipts had amounted to £10,292, as against £9968. The minutes were confirmed; and sympathetic allusion was made to the death of the late Water Engineer, Mr. Henry Teague.

ROTHERHAM CORPORATION GAS SUPPLY.

Annual Statement.

At the Quarterly Meeting of the Rotherham Town Council last Wednesday,

Mr. G. Gummer, in moving the adoption of the minutes of the Gas Committee, made his annual statement as to the financial and general position of the gas undertaking. He said that, though the net profits were less, there were circumstances in connection with the gas-works which would show that the working results for the past year were rather better than those of 1896-7. The gross profits in 1896-7 were £10,530, and last year £9230; while the net profits were £3744 and £2260 respectively—a difference of nearly £1500. Circumstances which had arisen (absolutely necessary in the carrying on of the works) had brought this about. Owing to an advance of 5d. per ton in the price of coal, they had paid £243 more than in 1896-7. During the year they had also had to deal with the award of Mr. C. E. Rhodes, in the matter relating to the agitation among the gas stokers; and this had entailed an extra expenditure of £179. In addition, the late Manager, Mr. M. Murdoch, found it necessary to increase to a very great extent the expenditure on renewals; and larger mains had been laid, at a cost of £461 more than in the previous year. He also mentioned several other items which had increased, and which made the total additional expenditure £2074. If the same circumstances had existed as in 1896-7, there would have been £500 more profit this year. Most gas companies and corporations had had to lament that the mild winter had been against them, from a gas point of view. The increased make of gas in their own case had been only about 13,333,000 cubic feet; and the consumption had only advanced by 6,250,000 cubic feet. The Council would be pleased to know that the prepayment meters had increased the consumption of gas by 11,500,000 cubic feet. There were now 4418 of these meters in use, which was an increase of 920 during the year. When they compared this with the progress made in other towns, particularly in Sheffield, he thought they would regard it as satisfactory. Proceeding, he stated that, with regard to the renewals and extra expenses, the department had laid during the year 6255 yards of mains, and 11,192 yards of service-pipes; and they had at the present time about 53 miles of gas-mains in the borough in use. Many complaints had been made with respect to the quality of gas; and it had been the study of the Engineer to remedy this matter. They had now before the Council recommendations that something like £4000 should be spent with the view of increasing the size of the mains. But in spite of these complaints, it seemed rather strange that the average illuminating power had been 18¾ candles. Looking to the near future, and dealing with the profits, he saw the Council were appropriating £500 more than had been recommended. He thought they should bear in mind that nearly all the extra expenses to which he had referred would continue, and that there might be increased charges for interest on stock. He did not think, therefore, they should anticipate during the present year much relief to the rates from the Gas Department. Further, he considered the time would come shortly when they ought to study the consumers more than they did. They had a monopoly; and it looked like taxing the consumers twice. Not only did they pay for the gas they consumed, but also for the public lighting, and to make up the deficits on the markets; and they were anticipating during the year that the consumers would pay an expected loss on the Water Department of £1500. It was also proposed in the minutes that they should not only take over the annual cost of the public lighting, and all charges for wages and maintenance, which in itself was something like £3000, but also the deficits on the water-works and highways. He thought the time would come when, while they were doing these things, they should reduce the price of gas. Of course, it would be absurd to attempt to do so at the present time, in face of the enormous expenses, without seeing what could be done with the new plant. He thought, however, it would be well for the Committee to take this aspect of the case into consideration.

Mr. Cox seconded the motion.

Mr. Hirst did not consider that the results of the department held out a very bright future. The quality of the gas was far from perfect, and not what it ought to be; and the profits were not at all satisfactory.

Mr. F. Mason, on the other hand, considered the results had been very satisfactory, though he admitted that the illuminating power of the gas had not been so. The reason of this was that they had not enough pressure to give a brilliant light, because the mains were not sufficiently large for the purpose.

Mr. Jenkinson did not regard Mr. Gummer's statement as satisfactory. Instead of the profit amounting to £3000 or £4000, as they had been led to expect, it was only £2600.

Mr. MASON: You cannot eat your cake, and have it too.

Mr. JENKINSON said he was aware of that. Mr. Gummer had held out hopes that they would have a different state of things when the new works were in operation. He did not think they should encourage this hope among the ratepayers. Instead of increasing profits, he should look in the future for some slight reduction, because the cost of coal would be heavier than in the past. He did not anticipate a reduction in the charges in other directions. The loan charges would increase; and there would be no saving in the cost of labour—the tendency being in the other direction. Personally he could see no chance for some years to come of any reduction in the price of gas.

Mr. GUMMER, in reply, thought Mr. Jenkinson had taken rather too despondent a view of the situation. When the Gas Department had an increased consumption, and the extensions had been completed, the probabilities were that, with the profit thus obtained, they would also be able to reduce the price.

The motion was adopted.

STOCKTON CORPORATION GAS SUPPLY.

The members of the Stockton Town Council were last Tuesday informed by the Chairman of the Gas Committee (Ald. R. Hind, J.P.) that the total make of gas during the past year was 329,452,000 cubic feet. This was a decrease of 3,634,000 cubic feet, as compared with the previous year; and he attributed it to the engineers' strike and the fine winter. The unaccounted-for gas was only 4 per cent. as compared with 5 per cent. in the previous year; he remembered the time when it was 10 per cent. The average illuminating power of the gas was 17·04 candles. This was higher than they were bound to supply by Act of Parliament; and consequently the townspeople obtained a good and pure supply of gas. The sulphur compounds at present averaged only 8·06 grains per 100 cubic feet; the parliamentary limit being 20 grains. The profit on the working had been £4932, as compared with £5402 in the previous year. This falling off was due to the decreased prices of the bye-products; there being a loss in respect to tar alone of nearly £700. Alderman Hind proceeded to give some information as to the process of making carburetted water gas and its advantages. Speaking about the carbon monoxide, he said there was not much in the gas as sent from the works. The minimum had been found to be 7·53 per cent. and the maximum 10·20 per cent. Many gas-works in the country sent out 14 and 15 per cent. with their common coal gas; so that carburetted water gas could not be objected to on this account. They only used it as an auxiliary to the coal gas; and if employed with care and discretion, as had been done up to the present time, it considerably increased the illuminating power, was exceedingly valuable in case of emergency, and was economical.

DARWEN GAS AND WATER UNDERTAKINGS.

Annual Accounts.

At the Meeting of the Darwen Town Council yesterday week, the Chairmen of the Gas and Water Committees made their customary statements as to the financial results of the working of their respective departments during the year ending March last.

Alderman DAVIES, in moving the adoption of the minutes of the Gas and Electric Lighting Committee, said the report of the Borough Treasurer showed a satisfactory profit from the Gas Department of £2056. This was not as much as was made in the preceding year, when the profit amounted to £3717; but the price of gas had been reduced 3d. per 1000 cubic feet, which had run away with £1680. Then there had been an increased cost in the maintenance of the works of rather more than £530; and there had been other additional expenditure, which came altogether to £2510. On the other side, there had been a gain of £368 on residuals, owing to the rise in the price of sulphate of ammonia; and the increased quantity of gas sold had produced £470. Deducting the increase of revenue (£838) from the £2510 left £1672, which gave them an actual profit of £2056; so that it was rather more than might have been expected, taking everything into consideration. He thought the Gas Manager (Mr. A. H. Smith) might congratulate himself on the result of the year's working. As to the consumption of gas, the increase was divided as follows: Ordinary meters, 3,796,500 cubic feet; gas-stoves, engines, &c., 1,500,000 feet; and prepayment meters, 3,565,000 feet, or 117 per cent. The prepayment meters had certainly been a great success. Through them 6,608,700 cubic feet of gas had been sold during the twelve months; and seeing that there were none in the town four years ago, he ventured to say that they had been a very great benefit to the Gas Department. He hoped this state of affairs would continue. The total increase of gas sold was 6·3 per cent. During the past two or three years, the capital had been reduced by £6000 or £7000; and he now considered that, for the production of gas, it was not extravagantly large. The amount they now owed was £119,627. This was the net capital; and it stood at the rate of 15s. 2d. for every 1000 cubic feet of gas sold. Looking back to 1889, they would find that the capital was then equal to £1 5s. 7d. per 1000 cubic feet sold; so that they had improved their position to the extent of 10s. 5d. During the nine years, the increase in the amount of gas consumed had risen from 102,900,000 cubic feet to 157,916,000 feet—an increase of 55,000,000 feet, or 53 per cent. The tendency had been, Alderman Davies proceeded, to equalize the price of gas; and the Manager had suggested that the price be again reduced, this time to one uniform rate—viz., 2s. 6d. per 1000 cubic feet. If it was decided to so alter the price, it would reduce the expenditure on meters. There were at the present time 820 meters only doing half service, in consequence of there being two in the same house. The number of prepayment meters in use was 1096; and from them an income had been derived of £1120—that was, each meter represented an income for the year of about £1. If the price of gas was reduced all round, more gas would be given for a penny.

Alderman COCKER seconded the motion, which was adopted.

Alderman DUXBURY said, so far as the Water Department was concerned, it showed a profit of £799. The income from water-rentals was £205 more than last year; but owing to a falling off of £25 in the trade account, the total made was £175 over and above what was received last year. The total quantity of water delivered to the town during the past twelve months was 178,510,000 gallons. Of this quantity, 34,359,000 gallons was taken for trade purposes; leaving 144,151,000 gallons for domestic use, or an average daily consumption of 10·53 gallons per head on the estimated population of 37,500. Although there had been a larger amount of water drawn this year, the profit was about £127 less than in the previous year. This had mainly arisen owing to repairs that had taken place in different parts of the town; and rates, taxes, salaries, &c., were considerably more this year than last. As the town grew, he had reason to believe that a good revenue would continue to be obtained from the Water Department. But he would strongly recommend to the Council that, whatever profits might be made, nothing should be allocated to any other department. The time would come, and undoubtedly very shortly, if they bought the watershed as had been proposed, when they would have to allocate some of the profit to that and the cleaning out of the reservoirs. He would do everything that lay in his power, at reasonable expense, to get hold of the watershed, and to make the water as pure as possible. He moved the adoption of the minutes of the Water Committee.

Alderman WARDLEY seconded the motion, which was carried.

DUKINFIELD GAS DEPARTMENT.

The Past Year's Working.

The balance-sheet which accompanies the report of the Gas Engineer and Secretary of the Urban District Council of Dukinfield (Mr. Harrison Veevers) for the past financial year is of a favourable character; the profit available for the reserve fund amounting to £517, which clears off the adverse balance, and leaves £222 to the credit of the fund. The gas-rental amounted to £9322, as compared with £9241 in the year 1896-7; the total revenue being £11,068, against £10,999. The expenditure was £7410, as compared with £7462; the balance being £3658, against £3536. The quantity of gas made was 75,349,000 cubic feet, of which 67,711,500 cubic feet were sold and used on the works, as compared with 67,612,100 cubic feet so disposed of in the preceding year. The profit works out to 1·83d. per 1000 cubic feet of gas sold. Last year it was 1·22d. A table giving the various items of the balance-sheet for the past eleven years shows that in 1888, the income from gas was £8050, with the price at 3s. 4d. per 1000 cubic feet; whereas in the year just closed it was, as mentioned above, £9322, with the charge for gas at 2s. 11d. In 1888, the hire of meters produced £91; but in the following year the Council sacrificed the bulk of this source of revenue by supplying meters free to consumers of less than 50,000 cubic feet of gas per quarter. Prepayment meters have been introduced at Dukinfield; and Mr. Veevers says their popularity continues. There are 515 in use, and the demand increases. These meters, of which 115 were fixed during last year, registered 3,839,000 cubic feet of gas. One unsatisfactory feature of the year's work is the increased leakage of 2,007,600 cubic feet over that of 1896-7—amounting to 10·13 per cent. as against 7·68 per cent. of the make. This extra leakage is attributed to the fractures of gas-pipes caused by certain sewerage operations. The works, mains, and services are in good order; and Mr. Veevers does not anticipate that any extensions or important alterations will be required during the current year.

BLACKPOOL CORPORATION GAS SUPPLY.

Mr. John Chew's Annual Report.

In the "JOURNAL" last week we recorded briefly the result of the past year's trading of the Gas Department of the Blackpool Corporation. We have since received the report of the Gas Engineer (Mr. John Chew), which opens with the statement that the year was a "record" one; the growth in the production and use of gas having exceeded any previous twelve months in the past. The make reached 342 million cubic feet; being 28 millions more than the previous year. Upwards of 1200 new service-pipes were laid for new consumers, 750 of which have been brought into use; the remainder are fixed in houses not yet finished, the bulk of which will no doubt use gas hereafter. Very considerable alterations and extensions were made in the mains; 8½ miles of new cast-iron pipes from 3 to 24 inches in diameter, having been laid. Of these, 1¼ miles have replaced smaller pipes taken up; leaving a net increase of 7¼ miles, and bringing up the total length laid from 57 miles in the previous year to 64¼ miles now underground. To these mains are attached 10,500 service-pipes for lamps and private houses. The leakage last year was again only 1 per cent. During the year the coin-meters were increased by 300; making the present number of this class of meter at work 643. Extensions of the lime purifiers and alterations and enlargement of the engine and purifying houses are now going on; and the first steps have been taken for the erection of a new holder and tank for the storage of 1½ million cubic feet of gas. Turning to the financial side of the year's working, the capital account has been increased by £9340. Out of this sum there was spent £4050 for mains, £2067 for meters, and the remainder for land, works, apparatus, and lamps; bringing the total capital expended at this date up to close on £115,000. Mr. Chew says that the ensuing year will require a further expenditure of £20,000. Coming to the revenue account, the total expenditure was £37,024—being £3200 more than the previous year; and the income from private consumers for gas was £37,305, or £3467 more than before. The lamps brought in £4055, being £300 more; coke shows up for £5012, or £413 more; tar, ammonia, and sundries give £7458, or £1857 more. These together make a total income of £54,032, or an advance of £6036 on the preceding year. From this it will be seen that the gross profit is over £17,000, from which must be taken the interest and sinking fund, about 4¾ per cent., and the renewal fund, 1 per cent.—together (say) £6600; leaving a balance in favour of the rate funds of over £10,400, or £2000 more than last year. This amount is equivalent to a sum of 10d. in the pound towards the rates. The price of gas is now 2s. 4d. per 1000 cubic feet, with free meter, grillers, and burners, all fixed free.

STALYBRIDGE CORPORATION GAS SUPPLY.

Good Management at the Gas-Works—Increase of Mr. Carr's Salary.

At the Meeting of the Stalybridge Town Council last Tuesday, the minutes presented by the Gas Committee set forth, among other things, that they had resolved to increase the salary of the Engineer and Manager (Mr. W. Carr) by £100 per annum. The Chairman of the Committee (Mr. Carter), having moved the confirmation of the minutes, Mr. Callaghan, while congratulating the Committee on the profit made during the past financial year, expressed surprise at the absence of any explanation of the proposed increase, and questioned their right to make it. He pointed out that the wages paid for labour at the works had decreased by £514, as compared with what they were two years ago; and he supposed he might assume that the diminution arose from the introduction of labour-saving appliances, which had curtailed the number of men employed. If this were so, the duties and responsibilities of the Manager must have been proportionately lightened; and, in the face of this fact, he disputed their right to dip into the public purse to the extent of £100. He moved, as an amendment, that the recommendation be sent back to the Committee. Mr. Tabbenor seconded the amendment. Alderman Ridyard remarked that Mr. Callaghan had himself furnished the fullest justification for the increase proposed, when he alluded to the fact that in two years the Manager had carried out such alterations in the works that in the carbonizing of coal alone he had saved £514. Was 4d. per 1000 cubic feet less in the price of gas no justification, or the money handed over to the borough fund from the gas profits? To his mind, a manager was entirely out of the ordinary rules with regard to wages. He was a man who had not only to take responsibility in the gas-works, but had to a large extent to see that the whole thing was a paying concern; and the rules that would govern the ordinary conditions of a number of men all working at the same thing, could not possibly apply to a manager. Mr. Carter said a large profit had been made; and in the history of the works since they became the property of the Corporation, such a thing had never been accomplished before. Mr. Callaghan evidently did not look upon the reduction in the amount paid in wages as a saving to the Corporation, and seemed to think no credit was due to the Manager. He would tell Mr. Callaghan that, from a commercial point of view, the contrary was the case, and that the ratepayers had reason to be thankful that they had such a Manager at the head of affairs. If they desired to retain the services of a capable Manager, they must pay him a salary commensurate with his abilities. On a vote being taken, Messrs. Callaghan and Tabbenor were the only members who voted for the amendment. The original motion was then put and carried unanimously.

TEIGNMOUTH GAS-WORKS FINANCES.

Increase in the Price of Gas.

Another discussion on the unsatisfactory position of the finances of the Gas Department took place last Tuesday at the meeting of the Teignmouth District Council. The matter came up in a report by the Finance Committee, which recommended that the position should be fully explained to the Local Government Board, with a view to the Council obtaining sanction for an advance of £1000 from their bankers, in order that all accounts might be put in a proper and satisfactory state. The Committee also recommended that the price of gas be increased by 5d. per 1000 cubic feet from June 30. Mr. F. Wheatley, the Chairman of the Finance Committee, moved the confirmation of the report, and expressed the opinion that the time had arrived when they must adopt some drastic remedy in reference to the gas accounts. The position had been unsatisfactory for some time; and the Council must now remedy it. As owners of the gas-works, the consumers would not, he thought, object to the small increase in the price which was necessary to place the concern on a more businesslike footing. While they were owing accounts for six, seven, or eight months, they could not deal with tradesmen and merchants in the same manner as if they were in a position to pay cash. Mr. F. Slocombe said the position of affairs was due to the gas-works having been started without capital, with the result that they had had to use the current income to pay off old debts. At present, they were sending out good gas; but there was not enough of it. If the consumers had a good supply, they would not mind paying a little more for it; but the supply was not good. The consumers were to pay 5d. per 1000 cubic feet more in order to enable the Council to raise a working capital for the works, and to make good the £800 which they were short. This was unfair. In his opinion, the proposal was illegal, as well as inequitable. He challenged any member of the Committee to say what it cost to produce 1000 cubic feet of gas. He moved that the portion of the report proposing an increase in the price be referred back to the Committee, and that in the meantime the Clerk present a report showing the cost of the manufacture of gas, and a statement of the liabilities on the gas account. Mr. R. England seconded this amendment, and protested against the proposal to obtain a loan from the bankers to pay off the liabilities, which was a round-about way of saddling the debt on the ratepayers, instead of requiring the consumers of gas to pay it. Mr. G. H. Jarvis supported the recommendation of the Committee, and said the Council had been losing £300 a year through using Dunbrach coal, instead of Newcastle coal. This was the cause of the deficiency; and at the root of it was the debt of £700 which they owed for coal. Mr. Slocombe denied this, and contended that the coal which they were using was of better quality than Newcastle coal, and worth the difference in price. The Chairman (Colonel Morrison) said the Council had been the laughing-stock of the ratepayers for several years. It was a disgrace to any municipal authority not to be in a position to pay its just debts. The amendment was lost, only three members voting for it; and the report of the Finance Committee was adopted. The price of gas will therefore be increased from 3s. 9d., the present rate, to 4s. 2d. per 1000 cubic feet. The Gas Committee reported that the Local Government Board had sanctioned loans of £2559 and £761 for gas-works purposes, but had deferred consideration of the loan of £3460 for the purchase of land and the erection of an additional gasholder and tank until the new site was decided upon.

METROPOLITAN WATER SUPPLY COMMISSION.

Twentieth Day—Monday, May 2.

(*Viscount* Llandaff, *Chairman*, *Sir* John E. Dorington, Bart., M.P., *Sir* G. B. Bruce, M.Inst.C.E., *Major-General* A. de Courcy Scott, R.E., *Rt. Hon.* J. W. Mellor, Q.C., M.P., *Mr.* A. de Bock Porter, C.B., *Mr.* H. W. Cripps, Q.C., *and Mr.* R. Lewis.)

The sitting took place at the Westminster Town Hall.

The following Counsel are engaged: Mr. Pope, Q.C., and Mr. Claude Baggallay, Q.C., for the New River Company; Mr. Littler, Q.C., and Mr. Lewis Coward for the Kent Water Company; Mr. Pember, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. Rickards for the Chelsea Water Company; Lord R. Cecil for the Hertfordshire County Council; Sir Joseph Leese, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. Balfour Browne, Q.C., and Mr. Freeman, Q.C., for the London County Council; Sir R. Nicholson for the Middlesex County Council; and Mr. Gabriel P. Goldney (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. Bircham and Co.

Sir *Arthur Arnold*, in further evidence, referred to the statement that the County Council were liable to give their employees higher wages than was fair or customary; and taking the instance of the wages of the park-keepers, which had been dealt with in detail earlier in the proceedings, he contended that those now being paid were only proper and reasonable. With regard to the allegation that the Council were overworked, he said this was untrue. There were no arrears of business; there had been none; and the Committees were overmanned, the difficulty being to find places for all the members who desired to be placed on them. He also gave a denial to the statement that the Council was of a political and partizan character—a statement which had been interpreted in some quarters to mean that the Council wasted their time in political discussion. On the question of the terms of arbitration, he said he did not wish to exclude anything from the consideration of the arbitrator; but he should object to an arbitration under the Lands Clauses Act, because it involved technical rules from which the arbitrator should be free. One such rule was that an allowance should be made for the sale being forced. In desiring to set aside the Act, he disclaimed any wish to take advantage of the Companies. He did not so much object to the Act itself as to the customs that had grown up under it.

Mr. Cripps: Would it not be easy to say that the arbitrator should not be bound by any practice which had grown up under the Lands Clauses Act?

Witness: Do you mean in an Act of Parliament?

I mean in the Act which we should have to recommend?—That would be adopting my wishes—setting aside the Lands Clauses Act. It would be acting in accordance with the wish I expressed on the part of the Council to the Chairmen of the Companies. With regard to Sir John Lubbock's suggestion that two representatives of the public should be appointed to the Boards of each of the Water Companies, to assist in their administration, I think this would not be a desirable alteration.

Mr. Mellor: Putting aside the question of purchase, do you think it would be possible for the Companies to amalgamate?

Witness: It does not appear to me that it would be possible to compel them. I do not see what force could be applied. There are certain advantages in amalgamation. Take the famine in East London, this would have been avoided if there had been a community of supply. But I do not see how it would be possible to compel the Companies to amalgamate, even on arbitration terms. If it were done, though it would undoubtedly be a great improvement on the present state of things, purchase would not become less desirable, because there would then be a single monopoly in the hands of a private Company. Even supposing there was amalgamation, and a uniform rate, I do not see how adequate control could be exercised. For instance, how would it be possible to compel the Companies to add to their sources of supply? I do not think the ratepayers would have confidence in any other body than that which directly represented them. There should not be any other control than that of the governing and representative body. Regarding the City, I think the bargains between the consumers and the New River Company existing there are very unfair. As a rule, a water supply is pure in proportion to the bigness of the authority supplying it; and small authorities thus find it a great advantage, if wanting water, to be in the neighbourhood of a large water authority. London is certainly as capable of getting a fresh supply from Wales as Manchester and Birmingham, because London has not to deal with many minute matters of local government (which these places have), owing to the existence of many small local authorities in London.

By Mr. Baggallay: The case of the purchase of the London Water Companies differed absolutely from any other instance of purchase. The eight Companies had such interlacing authority, such overlapping powers, that there had been no case analagous to it. Some questions were put to witness as to particulars of the interviews he had had with the Chairmen of the Companies; but after discussion, the matter was not pressed.

Dr. *Shirley Murphy*, Medical Officer of Health for the Administrative County of London, examined by the Chairman, said the question of purchase was closely connected with the question of the purity of the water, and therefore with health. The Companies were at present drawing their supplies from rivers exposed to some amount of pollution; and there was a probability that the communities giving rise to this pollution would be increased. It was important, therefore, that the most complete system should exist for ascertaining whether at any time these pollutions, despite the efforts of the Companies by filtration, &c., were inflicting harm. Machinery did not exist for the purpose at present. Anybody investigating the prevalence of disease, would wish to have particulars as to when the water was received; whether it was flood water or not; as to its distribution; the area and time of distribution; and so on.

Major-General Scott: If this information were given to the Local Government Board—which it is not at present—would that meet your object?

Witness: No; because it appears that the interest of the water-owning and disease-preventing authority must be identical. Further, it would be an exceedingly difficult position that a Company should be asked to supply information which might be afterwards used against them.

Witness, in further examination, said that, as to whether it was not customary to have one body to watch another body, he held that a large body like the County Council would be able to correct any faults; and he should have no hesitation in trusting them with such powers as he had indicated. He agreed that if purchase took place, and the concerns were amalgamated, so that the water from a number of different sources were mixed, the difficulties of observation would become greater; but they could be overcome.

The CHAIRMAN: You do not regard London water as healthy water?

Witness: I am not disposed to find much fault with London water; but, like all water drawn from rivers, it is variable in quality. The Thames is a river subject to floods; and that shows in some degree upon the water.

On it being pointed out to witness that the character given to water by the Official Examiners and Analysts was very high, he said it would be quite possible to take water and so adulterate it with poison as to make it dangerous, and yet the chemist would be unable to detect it. A test as to the quality of water was to see if it gave rise to disease.

Major-General SCOTT: Is not the typhoid rate lower in London than in most cities?

Witness: That is so.

The CHAIRMAN: A low enteric fever rate?

Witness: Yes. I wish to add that the enteric fever rate may not always be low, because at present we have a very feeble virus. Enteric fever a few years hence may be a more serious matter than now.

Cross-examined by Mr. CLAUDE BAGGALLAY: East London was the district where typhoid was most prevalent; but he did not associate this with the water supply. It was a district where the inhabitants were badly off, and in the least sanitary condition. He had never applied to any of the Companies for particulars regarding their sources of supply; and the information therefore had never been refused him.

Further examined by the CHAIRMAN: If he were empowered, as Medical Officer, to examine the reservoirs and filter-beds whenever he thought necessary, it would not enable him to make all the inquiries he desired, because he rather wished to investigate the distribution of particular water, when it was received, and when it was distributed—information which should be supplied by the water-owning authority. He wanted to know whether particular water was attended with an increase of typhoid or not. If the officials of the County Council were in charge of the water, he thought the information obtained from them would be more reliable than that given by the Companies. The Engineers and officers concerned in the management would be his brother officers; and the facilities for obtaining the information he wanted would be greater than could possibly be the case if the concerns were in the hands of the Companies.

Mr. *George F. Deacon*, M.Inst.C.E., in reply to the CHAIRMAN, said he was employed by the London County Council in conjunction with Sir B. Baker, to report as to the cost of the Welsh supply; and he had compared the cost of it with the Staines Reservoirs Scheme. At present, there was power to take 185½ million gallons of water daily from the Thames; and he assumed that when the Staines scheme was complete, the quantity would be raised to 300 million gallons. It was in respect of the balance of 114½ million gallons that he had taken out the cost, which was £8,661,330—being £5,540,000 for works, and £3,121,330 the capitalized cost of the extra pumping charges. As each instalment of the Staines scheme was proceeded with, the cost of taking water from the Thames would be enormously increased per unit delivered. With regard to the suggestion that ninety days' storage capacity of the ultimate maximum quantity that would be required was sufficient, he said this was utterly out of the question. The £5,540,000 would supply storage for about 19,000 million gallons.

The CHAIRMAN: In this storage, there would be room to supply the whole draught authorized, and to be authorized, from the Thames up to 300 million gallons?

Witness: Yes—and above 185½ million gallons.

Examination continued: The authorized storage under the Staines scheme was 3284 million gallons. His scheme excluded consideration of water which any of the Companies might be empowered at present to take from the river below Staines. If they were authorized to take any—say, 130 million gallons daily—he would have to alter his scheme altogether. Coming to the Welsh scheme, on which he and Sir B. Baker reported to the County Council, he said the first two instalments, giving a supply of 133⅓ million gallons daily, could be carried out for £11,975,260; or leaving out two small reservoirs (which would reduce the supply to 121 million gallons), the cost would be only £9,848,260. So that, though the Welsh scheme would cost more, it would bring in more water. If the scheme were brought in to this extent, there would be a reduction of pumping from the Thames, because they would not want all the Welsh water and that from the river besides. To a large extent, therefore, the Staines supply would be held in reserve. He estimated the saving in pumping, coal, attendance, &c. (taking the rate of increase of population at the figure assumed by the Royal Commission), at a figure which, capitalized, amounted to £1,000,000. Deducting this, gave a figure, of £8,000,000 odd as the capital cost of bringing 121 million gallons from Wales, as compared with £8,661,330 under the Staines scheme for 114½ million gallons daily.

By Major-General SCOTT: He agreed with the estimate of the promoters of the Staines scheme, so far as it had been approved, including the Bill that was now being promoted. Their figure of the cost of storage was £380 per million gallons; his was £301. If the present supply from the Thames was to be continued, it must be under the system of reservoirs indicated in the Staines scheme. The results would be disastrous, if it were not—disastrous to the river, and disastrous also in a sanitary sense. The Southwark and Vauxhall Company were applying for power to take more water from the Thames; and the extra reservoir capacity involved in the application would have to be brought into the reservoir scheme. This was a reason, it seemed to him, why this piecemeal work could not go on. Obviously it gave a great advantage to the Companies who first obtained extra powers, in view of the fact that the cost of storage of each successive quantity of water was much greater than those preceding it. The taking of more water from the river should be done as a scheme common to the whole of the river Companies.

By Sir J. E. DORINGTON: The present authorized draught on the Thames was about 185 million gallons daily. Looking to the possibility of 300 million gallons being required, it was suggested that they should go to Wales and bring 121 million gallons from there. The draught upon the Thames would therefore be reduced to about 64 million gallons at first, which would be a great saving. It would render the Staines reservoirs to a large extent unnecessary at that moment, and would reduce the pumping; but as the demand grew up to the 300 million gallons daily, the use of the reservoirs and the pumping would increase.

By the CHAIRMAN: Whether or not they drew water from Wales, if they continued the draught of 185 million gallons from the Thames, the Staines Reservoirs money must be expended to the extent of the 185½ million gallons. Even if they discontinued taking part of the 185½ million gallons from the Thames, they would still have to meet both the Staines and the Welsh expenditure. The public, however, would be saved the expense to begin with of providing storage, &c., for the extra 114½ million gallons.

By Mr. MELLOR: By bringing in the Welsh water, they would reduce the cost of providing storage and of pumping. London must continue to be supplied from the Thames to some extent; but a limit—certainly not greater than the present statutory limit—ought to be put upon this draught, for sanitary and national reasons. London ought not to be dependent entirely on a distant source.

By Major-General SCOTT: Every Company should possess an excess capacity of supply, to meet fluctuations in the demand due to changes of season, periods of exceptional drought, frost, &c. In the Metropolitan districts, this excess supply naturally had a tendency to run down. It involved there being, to some extent, dead capital; but whether there was a tendency to save capital by not maintaining the reserve capacity of supply to the proper extent, depended very largely on whether there was a direct benefit accruing to the Company in keeping down the expense. The question of limitation of dividends here came in. The deficiency, if it existed, would not be manifest until the time of drought, or strain, actually came upon the Company. It would be desirable that, in any system of control, there should be powers of inquisition as regards the actual power of the water-works from time to time. Without concurring in the view that any system of control would be sufficient, he thought the larger the measure of control adopted the better. The control should be of such a character as to detect any falling off in the maintenance of the reserve capacity; but it struck him that it was a dangerous interference with the authority of the water concern. As to putting a Company under statutory obligation to supply information in regard to their works, he did not think the mere giving of information was satisfactory. One could not tell, till the occasion arose, what kind of information was wanted. To do any good, they must have inspectors who, while in no sense in the pay of the Water Companies, were privy to all their actions—especially as to filter-beds. Documentary evidence would not be enough.

By Mr. PEMBER: He had not tested the soil on which the Welsh reservoirs were proposed to be constructed; but no engineer could have any doubt as to the suitability of the rock there for the purpose. The storage involved in the 133 million gallon scheme was 34,000 million gallons. The water from Wales could, with the exception of an insignificant quantity, be supplied to London without pumping; and those places which the Welsh scheme would not supply, could have their water from the Thames.

The twenty-first meeting of the Water Supply Commission was held yesterday—Lord Llandaff presiding; and all the Commissioners save Mr. Cripps being present. Mr. G. F. Deacon, who was examined at the last sitting, was recalled for the purpose of putting in a table in explanation of the evidence he had given. In reply to further questions, he said the taking of the water from the Thames was a necessary evil. One would not use it if purer water could be procured with equal facility. In drawing 185½ million gallons daily from the Thames, they had reached a point when the cost of taking further supplies would become excessive, and out of proportion to the increased quantity obtained. The present was therefore a good time to cease taking more water from the river, and to go to Wales or some fresh source.

Deacon Waste-Water Meters at Ince.—In the paragraph on this subject which appeared in the "JOURNAL" last week (p. 1011), a transposition of figures in the report from which the particulars there given were taken led to the perpetration of an error which we take the first opportunity of correcting. It was stated that to enable the Ince District Council to find out the leakages, they had paid to the Palatine Engineering Company, Limited, £916 16s. 3d., and had thereby saved in hard cash £590 3s. The sum actually paid was £196 16s. 3d.; and the saving named had been effected well within a year.

Totnes Gas Company.—The accounts submitted at the annual meeting of this Company yesterday week showed a disposable balance of £811; and it was resolved to pay the usual dividend of 12*s.* per share. The Directors reported that, as it appeared questionable whether the portion of a special resolution passed last year referring to the issue of fully-paid shares free of cost could be carried into effect, they had reconsidered the whole subject, and had determined not to proceed in the matter. In place of issuing preference shares, they had decided to expend the reserve fund for the purpose of the special outlay required, which would effect a saving of interest.

New Joint-Stock Companies.—The Lamp-Post and General Hydrant (Jones's Patent) Company, Limited, has been formed with a capital of £250, in £1 shares, to acquire and work patent No. 2586 of 1898, for a combined lamp-post and hydrant. The Sphere Lighting Company, Limited, with a capital of £12,000, in £1 shares, will adopt a certain agreement and carry on business as generators and suppliers of electricity for the purposes of heat, light, or power; also as electrical engineers, &c. Electricity, Limited, is the title of a Company formed, with a capital of £51,000, in £1 shares, to adopt and carry into effect a certain agreement, and generally to carry on business as electricians, mechanical engineers, and suppliers of electricity for the purposes of light, heat, motive power, or otherwise.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Aberdeen have not received much sympathy in their opposition, before Lord Jersey's Committee in the House of Lords this week, to the Bill of the Great North of Scotland Railway Company. Truth to tell, they do not seem to have deserved much; for they, in reality, made a mountain out of a mole-hill in the matter. The amicable arrangement which was expected was not effected; and the Bill went before the Committee, with a big array of the leading Counsel at the Parliamentary Bar. The principal objection of the Corporation to the Bill was the proposal of the Company to take a corner of the site of the Corporation gas-works, amounting to 300 square yards, for the extension of a goods station; but they made use of this objection as a foundation for certain other demands—such as the widening of streets, and the payment of compensation for the solum of streets which are proposed to be removed, and for the loss of rates upon property which it is intended to pull down. As Mr. Littler, Q.C., expressed it, in opening the case for the Railway Company, the Corporation "had adopted a plan which, he was sorry to say, had lately become too common among corporations who, when a railway company came to a town, tried to get hold of something more than might fairly be said to be their just due." That is only a half statement of the truth; for corporations are themselves subjected to pillage, on the part of individuals and companies, when they go to Parliament. I use the word "pillage," and consider it is not too strong to represent what takes place in many instances, for very often the claims which are made are notoriously high. In this case, the amounts claimed cannot be said to have been unreasonable; it is the power of the magistrates to make any claim whatever which was questioned. Mr. Littler showed that it had been decided, in this session of Parliament, that corporations do not own the solum of the streets in the town, and are therefore not entitled to compensation in respect of the street being taken. Compensation for loss of rates was out of court; for it is always a condition—not, however, invariably observed—that before houses occupied by the working classes be removed, others must be substituted for them, and there would thus be no loss of rates. A demand for the widening of the streets is more reasonable, as it is in the public interest that provision should be made for extended traffic in the future, as well as for existing traffic; but it is not justifiable to ask a railway company to bear the entire cost of such improvements. The expense ought to be largely borne by the Corporation. Upon the question of appropriating a portion of the gas-works site, the Corporation certainly took up the strongest ground they could; and they pleaded it in the only way which could have been effective—viz., that where the promoters of a scheme proposed to take a portion, they are obliged by statute to take the whole, of a property, and to have the value determined in terms of the Lands Clauses Act. What the Railway Company proposed to do was to give an equivalent in land; but this is a remedy, it was pointed out, which is not provided for in the Lands Clauses Acts. To have proposed that the Company should have taken the whole of the gas-works, would have been out of the question, and as a matter of fact it was not mooted. The plea which was put forward, therefore, simply amounted to this—that if the Committee had listened to it, the Bill would have been rendered useless. I acknowledge there was a very great difficulty in the matter, because the land which the Company offered in lieu, is upon the other side of a street—the disadvantage of which we all know. But this was surely a matter for amicable arrangement; and I cannot help feeling that it would have been so arranged, had there not been the other things which the Corporation desired to claim. The Corporation plan, it was stated, would have just about doubled the cost to the Railway Company of their improvement. I put it to the Corporation whether that was a proper object to aim at, for the sake of a present advantage. The community of Aberdeen are anxious that their city and port should become the gateway to the north of Scotland; and this can only be accomplished by the co-operation of the Great North of Scotland Railway. Everything which hampered the Railway Company in the conducting of their traffic, or which raised their charges, would have the effect of driving traffic past the city; and therefore it was the duty of the Corporation, in the interests of their own citizens, to even stretch a point and let the Company have every facility possible for bringing traffic to the city. I daresay there is a little soreness in the Corporation at the action of the Railway Company, who are about to transfer their workshops from the city to Inverurie, about twenty miles away; but this step is being taken on account of the great cost of extensions in the city. If there be this feeling, it is a mistake to attempt to punish the Company for it. Revenge is always detestable; in the case of a public body it is foolish, and sometimes disastrous. If, for instance, the Company were to make a cross-country connection with Peterhead, where a large harbour is at present being built by the Government, they might, at little cost to themselves, take away a large quantity of the trade of Aberdeen. Is there any comparison between the effect which such a policy would have upon Aberdeen, and the effect of taking 300 yards of the site of the gas-works? I should think not. This is the reason why the Corporation do not deserve sympathy. Lord Jersey seemed to be of the same mind, for he expressed the opinion that there need not be "any desperate fight." Yet a desperate fight there was; and the end of it is that the Corporation have got a provision inserted that if the Railway Company take part of the site of the gas-works, they shall give the Corporation 50 per cent. more than they take. If they take the whole 300 yards, they shall give 450 yards. This is not unfair, when the severance of the works is considered. But the Railway Company may, after all, not take any of the land; and in this event, the Corporation would have incurred all the cost of the parliamentary inquiry without having anything to show for it.

The cost of the inquiry will not be small. There were five Counsel engaged; and there were seven witnesses on the one side, and eight on the other. In this connection, I would like to say a word as to the Bill which is before Parliament for the amendment, or rather revolutionizing, of Private Bill Procedure in Scotland. Were this Bill in force, and this inquiry had taken place in Aberdeen, instead of in London, how would the costs have been affected? I leave out of account the fees that were

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 1056.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 15	10½	Alliance & Dublin 10 p. c.	23½—24½	..	4 5 9
100,000	10	"	7½	Do. 7 p. c.	16—17	..	4 8 3
300,000	100	Jan. 3	5	Australian 5 p. c. Db. .	105—107	..	4 13 6
200,000	5	Nov. 11	6†	Bombay, Ltd. . . .	5⅝—6⅛	..	4 16 0
40,000	5	"	6†	Do. New, £4 paid .	4⅝—5⅛	..	4 11 5
380,000	Stk.	Feb. 24	12	Brentford Consolidated	293—298	..	4 0 6
240,000	"	"	9	Do. New . . .	215—220	−8	4 1 10
50,000	"	"	5	Do. 5 p. c. Prf.. .	140—145	..	3 9 0
159,375	"	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138	..	2 18 0
220,000	Stk.	Mar. 30	11½	Brighton & Hove Orig. .	270—275	..	4 3 8
218,820	"	"	8½	Do. A. Ord. Stk. .	195—200	..	4 5 0
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max. .	127—132	..	3 15 9
420,000	20	Mar. 30	11½	British	55—56	..	4 0 4
50,000	10	Mar. 11	11½	Bromley, Ord. 10 p. c. .	25—27	..	4 5 2
75,000	10	"	8½	Do. 7 p. c. .	20—22	..	3 17 3
500,000	10	Apl. 29	6	Buenos Ayres (New) Ltd	8¾—9¼*	..	6 9 9
98,122	Stk.	Dec. 30	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	Mar. 11	8½	Cagliari, Ltd. . . .	30½—31½	..	5 4 9
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16—17	..	4 14 2
50,000	50	May 3	6	Do. 6 p. c. 1st Mort.	58—60*	..	5 0 0
550,000	Stk.	Apl. 15	13½	Commercial Old Stock .	323—328	−5	4 2 4
200,750	"	"	10½	Do. New do. . .	250—255	..	4 2 4
200,750	"	Dec. 15	4½	Do. 4½ p. c. Db. do.	150—155	..	2 18 1
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	215—225	..	5 6 8
200,000	"	"	9	Do. 7 p. c. Prf. .	195—205	−5	4 7 10
51,600	Stk	Feb. 24	14	Croydon A 10 p. c. . .	310—315	..	4 8 11
168,400	"	"	11	Do. B 7 p. c. . .	255—265	..	4 3 0
535,000	Stk.	Feb. 24	5¼	Crystal Palace Ord. 5 p c.	128—133	..	3 18 11
60,000	"	"	5	Do. 5 p. c. Prf. .	142—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	23½—24½	..	4 9 9
354,060	10	"	11	Do. £7 10s. paid .	17—18	..	4 11 9
5,922,110	Stk.	Feb. 10	12¾	Gaslight & Coke, A, Ord.	282—287	+2	4 9 0
100,000	"	"	4	Do. B, 4 p. c. max. .	118—123	..	3 5 1
665,000	"	"	10	Do. C, D, E, 10 p c. Prf.	300—305	..	3 5 7
30,000	"	"	5	Do. F, 5 p. c. Prf. .	150—155	..	3 4 6
60,000	"	"	7½	Do. G, 7½ p. c. do. .	220—225	..	3 6 8
1,300,000	"	"	7	Do. H, 7 p .c. max. .	195—200	..	3 10 0
463,000	"	"	10	Do. J, 10 p. c. Prf. .	300—305	..	3 5 7
476,000	"	"	6	Do. K, 6 p. c. Prf. .	178—183	..	3 5 7
1,061,150	"	Dec. 15	4	Do. 4 p. c. Db. Stk. .	132—135	..	2 19 3
294,850	"	"	4½	Do. 4½ p. c. do. .	150—155	..	2 18 1
958,000	"	"	6	Do. 6 p. c. do. .	202—207	..	2 18 0
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	215—220	+2	4 10 11
376,400	100	Feb. 1	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 3
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Db. Stk. "	103—106	..	3 6 0
560,000	100	Apl. 1	5	Met. of Mel- } 5 p. c. Db.	110—112	..	4 9 3
250,000	100	"	4½	bourne } 4½ p.c. Db.	107—109	..	4 2 7

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	Dec. 15	6	Malta & Medn., Ltd. .	5½—6	..	5 0 0
541,920	20	Nov. 11	5	Monte Video, Ltd. . .	15—16	..	6 5 0
617,946	Stk.	Feb. 24	9⅔	Newc'tle & Gatesh'd Con.	235—240	..	4 1 3
252,355	Stk.	Jan. 3	3½	Do. 3½ p. c. Db. Stk.	115—120	..	2 18 4
150,000	5	Nov. 26	8	Oriental, Ltd. . . .	8—8½	..	4 14 2
135,000	5	"	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	"	8	Do. do. 1879, £1 pd.	1½—2	..	4 0 0
60,000	5	Mar. 11	7	Ottoman, Ltd. . . .	4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas } 1st M. Bd.	104—109	..	5 10 1
500,000	100	Dec. 1	6	of Chicago } 2nd do.	103—108	..	5 11 1
848,070	10	—	—	River Plate Ord.. . .	9¼—10	+¼	—
250,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	99—101	..	3 19 3
250,000	10	Apl. 29	10	San Paulo, Ltd. . . .	15½—16½*	..	6 1 3
135,000	Stk.	Mar. 30	10	Sheffield A.	246—248	..	4 0 8
209,053	"	"	10	Do. B.	245—248	..	4 0 8
447,427	"	"	10	Do. C.	245—248	..	4 0 8
5,531,250	Stk.	Feb. 24	5½	South Metrop., 4 p.c Ord	132—135	..	3 17 9
1,460,000	"	Jan. 13	3	Do. 3 p. c. Db. Stk. .	103—106	..	2 16 7
60,000	Stk.	Mar. 11	12	Tottenham and } A. .	285—295	..	4 1 4
60,000	"	"	9	Edmonton } B. .	205—215	..	4 3 9
182,380	10	Dec. 30	7	Tuscan, Ltd.	13—14	..	5 0 0
149,900	10	Jan. 3	5	Do. 5 p. c. Dbs. Red. .	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	Dec. 30	10½	Chelsea, Ord.	320—330	..	3 3 8
150,000	"	"	5	Do. 5 p. c. Prf. . . .	177—180	..	2 15 6
160,000	"	"	4½	Do. 4½ p.c. Pf. Stk., 1875	157—160	..	2 16 3
175,785	"	Mar. 30	4½	Do. 4½ p. c. Db. Stk. .	158—163	..	2 15 3
1,720,560	Stk.	Apl. 15	8	East London, Ord. . .	228—228	..	3 10 2
654,740	"	Dec. 30	4½	Do. 4½ p. c. Db. Stk.	158—162	..	2 15 7
390,000	"	"	3	Do. 3 p. c. Db. Stk..	105—107	..	2 16 1
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	115—120	..	3 2 6
310,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
708,000	Stk.	Feb. 10	13	Kent	358—363	..	3 11 8
160,000	"	"	7	Do. New, 7 p. c. max..	213—218	..	3 4 3
1,043,800	100	Dec. 30	10	Lambeth, 10 p. c. max. .	295—300	..	3 6 8
406,200	100	"	7½	Do. 7½ p. c. max..	228—233	..	3 4 4
350,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
500,000	100	Feb. 10	13	New River, New Shares	440—445	..	2 18 5
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	142—147	..	2 14 5
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	155—160	..	3 15 0
126,500	100	"	6	Do. do. 7½ p. c. max. .	152—157	..	3 16 5
489,300	Stk.	"	5	Do. do. 5 p. c. Prf. .	174—179	..	2 15 10
1,019,585	"	Apl. 15	4	Do. 4 p. c. A Db. Stk.	140—143	−1	2 15 11
1,155,066	Stk.	Dec. 15	10	West Middlesex . . .	300—305	..	3 5 7
200,000	"	"	4½	Do. 4½ p. c. Db. Stk.	160—165	..	2 14 7
200,000	"	Mar. 11	3	Do. 3 p. c. Db. Stk.	105—107	..	2 16 1

* Ex div.

† Next dividend will be at this rate.

paid to witnesses, because they would have to be paid in Aberdeen as well as in London. If the outlays of the fifteen witnesses be taken at £30 each—and they can scarcely be so much as this—it would represent a total cost of £450. I do not know what the fees of Parliamentary Counsel amount to; but, when it is noted that Mr. Littler, Q.C., Mr. Balfour Browne, Q.C., Mr. Worsley Taylor, Q.C., Mr. Baggallay, Q.C., and Mr. Lloyd, were engaged, their aggregate fees for two days must have been far more than £454—possibly more than double that sum. I venture to say they would all have been in Aberdeen, had the inquiry been there, and possibly one or two Scotch Counsel along with them. Is it to be supposed that they would have taken a fee for exclusive attendance at Aberdeen for even double what they accepted in London? I venture to say they would not. They would have charged for four days—two for the inquiry, and one for travelling each way. Counsel, with their clerks, travelling, and hotel expenses, would have cost about £4000 in Aberdeen, as against possibly £1500 in London. There would also be the travelling and other charges of London Solicitors, who could not be left out. Against this, what would have been saved? About £140 for travelling expenses, and one or two hotel bills. This is how it would work out in every case of a contest. In this case, I calculate that it would have cost at least £2000 more to have conducted the inquiry in Scotland than in London. The proposed reform of Private Bill Procedure would, therefore, be of no advantage to Scotland, but the reverse. I have always looked upon it as so. In truth, the agitation for reform was originated by, and is being fostered in the interests of, Scotch Counsel.

It was reported to a meeting of the Hamilton Town Council on Thursday, that a draft balance-sheet for the past year had been made up, and showed the satisfactory surplus of £1947; and that it had been resolved to write off £1500 for depreciation of works and plant, and to carry forward the balance of £447. The accounts, being only in draft, are not to be considered till a future meeting.

In the Dumfries Gas Commission this week, it was reported that the tar produced in the gas-works had been sold for the ensuing year at 5s. per 100 gallons, which was 3s. less than the current price; and the ammoniacal liquor had been sold at 2s. per 100 gallons, which was 3d. more than is being obtained at present.

The financial year of the Dundee Corporation concluded last Saturday. It is already announced that the gas-rental for the year has amounted to £76,924, which is an increase of £1231 upon the previous year. There are 537 gas-stoves on hire, and 782 prepayment meters in use. The rental for electricity amounted to £6279, or an increase of £736.

The Electricity Committee of the Glasgow Corporation had before them yesterday a report by Mr. W. A. Chamen, the newly-appointed Engineer to the Electricity Department, upon extensions of the electric light plant in the city. Mr. Chamen recommends the expenditure of £395,987 upon new generating stations and distributive plant at Port-Dundas for the north, and Pollokshaws Road for the south of the city. Of the above expenditure of £395,987, the approximate sum of £45,000 will be required to pay for the plant already ordered, together with that which must still be obtained to make the Port-Dundas station complete up to 2200-horse power; a good deal of this being necessary expenditure in order to make a start, the full benefit of which cannot be reaped until further plant is put in. The portion of the Port-Dundas station now to be proceeded with, exclusive of site, which is already paid for, will cost, say, £31,000. This building will be large enough to accommodate 10,000-horse power all told. The clearing and fencing of the ground are already nearly completed, and partly paid for. The new mains now being proceeded with are those in the Springburn route, £14,012, and Ruchill, £4850. These items together make a total expenditure of £94,862, which the Corporation stand at present committed to. After the plant in the existing Waterloo Street station, which is to be closed, is relieved from duty, it can be removed to one of the two new generating stations; and for present purposes it will be convenient to consider it as being removed to the Pollokshaws Road station. The Waterloo Street station plant is capable of supplying some 96,000 lamps fixed, as before mentioned; and the 2200-horse power of the proposed new plant for the Pollokshaws Road station will supply some 64,000 more – thus making the portion of the last-mentioned station to be at first proceeded with capable of supplying some 160,000 lamps fixed. Adding the capacity of the first section of the Port-Dundas station—viz., 292,000 lamps—the grand total which can be supplied will be 452,000 lamps fixed. The capital expenditure at the present time is about £150,000; the capital expenditure proposed in this report is (say) £396,000; and the cost of removal of the Waterloo Street plant, £5000—making a total capital expenditure of £551,000. The revenue per lamp fixed for last year worked out to 6s. 4d. Though a reduced rate might possibly result in a lower revenue per lamp, this will only be consequent upon reduced total works costs; so that it will be safe to assume that last year's figures will hold good for both sides of the account. It is indeed possible, or even probable, that a reduced rate will not result in reduced revenue per lamp fixed, as the extensions now proposed may reach customers who burn their lamps or take power for longer hours. Manchester earns 7s. 11d. per lamp fixed, on a rate lower than is at present in force in Glasgow. The total revenue on 452,000 lamps fixed, at 6s. 4d., is £143,000. The total works costs may be taken at 40 per cent. of the revenue as it stood last year, and would therefore amount to £57,000. If depreciation and sinking fund are taken together at the extremely high figure of about 9 per cent., as was done last year, the amount for this item will be £50,000. Interest at 3½ per cent. on £551,000 would come to £20,000; making a total of £127,000. This would leave a surplus of £16,000 as a result of the year's working. It need hardly be pointed out that the surest way to arrive at a low rate of charge for the supply of electrical energy is to make the concern as large as possible; and it follows that the sooner the capital expenditure contemplated in this report is reached, the better. Applications for light and power are coming in from all quarters, and probably it will not be over-estimating the demand to say that the year 1901 will find the plant corresponding to the amount of capital expenditure before detailed fully taken up, provided, of course, that the plant can be delivered and fixed in time. The recommendations, therefore, are as follows: (1) That of the total amount (£288,057) proposed to be ultimately expended for the purpose of providing plant equal to 10,000-horse power

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for the section of the Port-Dundas station now to be proceeded with, and the mains connected therewith, the Corporation should in the meantime authorize the sum of £61,000, over and above the £95,000 to which they are already committed, to be expended; and (2) that the expenditure of the before-mentioned sum of £107,930 for the purpose of providing (*a*) the first section of the new station at Pollokshaws Road, (*b*) the first instalment of plant therefor—namely, 2200-horse power—and (*c*) the feeders and distributing-mains which it is at present intended to lay down in connection therewith, be also authorized. The total expenditure now proposed will be spread over a period of about two years. The Electricity Committee approved of the report, and passed it on to the Town Council.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 7.

Sulphate of Ammonia.—There has been a firmer tone in the market, and some improvement in Scotland, where makers have found a ready sale at £8 15s. per ton f.o.b. Glasgow, and £8 12s. 6d. per ton f.o.b. Leith. The closing quotations are £8 12s. 6d. per ton f.o.b. Hull, £8 13s. 9d. per ton f.o.b. Leith, and £8 16s 3d. per ton f.o.b. Liverpool. The best demand has come from Spain, for immediate and prompt shipment; but there has been a fair amount of inquiry from other points—the small available supply scarcely supporting the hope for lower prices which was recently entertained by buyers. Home demand in Scotland has been good; but that in England is falling off. From all points, there is a large inquiry for delivery July onwards; and it is reported that July-December has been done at £8 15s. per ton f.o.b. Leith. There is less interest in May-June deliveries; but for this position about the level of spot prices would have to be paid.

Nitrate of Soda is a shade easier on spot, owing to arrivals; and fine quality may be had at 7s. 4½d. per cwt. *ex* quay.

LONDON, *May* 7.

Tar Products.—Pitch is realizing a little more money; and the outlook for next season is hopeful. The Welsh strike, however, is preventing large quantities from being used up in that district by the fuel makers. But great activity is noted in the fuel-works both in Belgium and in Germany, as well as in the North of France; and it is possible that the increased consumption there will counteract the lessened quantity in Wales. The value of pitch is an important factor to the tar distiller, forming, as it does, a large proportion of tar. A good deal of business has been done during the week in benzols, clearing off important stocks that were weighing on the market. These sales have firmed quotations somewhat. One large gas concern gives excellent reports as to the economy of benzol for enriching gas at present prices—in this instance, using it, instead of petroleum oils, in conjunction with water gas. A very little extension of the use of benzols in this direction would soon make the article scarce, and improve its value. Creosote continues firm, with a good market forward. Carbolic acid is steady, but crude naphtha is weak, although makers are asking a little more money.

The business of the week may be summarized as follows: Tar, 10s. 6d. to 14s. Pitch, 21s. east coast; 17s. west coast. Benzol, 90's, 10½d.; 50's, 11½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2½d. Heavy naphthas, 1s. 2d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 47s. 6d. Carbolic acid, 60's, 2s. 1½d. Naphthalene, 55s.; salts, 35s. Anthracene, "A," 5½d.; "B," 4½d.

Sulphate of Ammonia.—A satisfactory move is noted in this market. A good deal of sulphate has changed hands during the week; and to-day prices are distinctly better. Dealers are reported to have oversold, and are paying stiff prices to cover at certain ports. Prices are: Beckton, £8 10s.; London, £8 15s.; Liverpool, £8 16s. 3d.; Hull, £8 12s. 6d.; Middlesbrough and Newcastle, £8 11s. 3d.; Leith, £8 12s. 6d.; Glasgow, £8 15s.—less 3½ per cent. in each case, excepting Beckton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The probability as to higher prices ruling for all descriptions of fuel so far as the forthcoming contracts are concerned, to which reference has been previously made, is receiving confirmation where business of any weight for forward delivery is concerned. Already on one important gas-coal contract that has been renewed, an advance of 6d. per ton over last year's rates has been maintained; and this would seem to represent the minimum that colliery proprietors are just now talking about when the usual gas-coal contracts have to be dealt with. As regards locomotive fuel, which was bought at an extremely low figure last year, there would seem to be a determination to hold out for an advance of 1s. per ton. As, however, one of the large companies has already purchased small quantities at about 3d. per ton over last year's rates, it may be doubtful whether collieries will be able to hold out for the full 1s. advance. Steam and forge coals are in fairly active request, and are maintaining a slight improvement in prices. Engine fuel—though some of the inferior sorts, and slack filled up out of stock, are rather hanging upon the market—is generally moving off tolerably well; and good qualities are not difficult to dispose of. Prices are steady at late rates. At the pit mouth, average quotations are 10s. to 10s. 6d. per ton for best Wigan Arley; 8s. 6d. to 9s., for Pemberton four-feet and seconds Arley; 7s. to 7s. 6d., for common house coal; 7s., for steam and forge coals; 3s. 3d. to 3s. 6d., for common slack; 3s. 9d. to 4s. 3d., for medium; and 4s. 6d. to 5s., for best sorts. In the shipping trade, there is still plenty of demand for all the coal that can be dispatched from the Mersey ports—which, however, are rather blocked owing to inability to deal with the extra quantities that shippers have required. Though special prices are still being obtained, these scarcely represent more than about 1s. per ton over normal rates; good steam coal, delivered at the ports on the Mersey, not averaging more than 10s. to 10s. 6d. per ton.

Northern Coal Trade.—There has been an even increased demand for coals in the North-east; but the collieries are now working fully, so that it is impossible to meet all requirements, especially for best steam coals. For best Northumbrian steam coals, the quotation is 13s. 6d. per ton f.o.b.;

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WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
TORONTO (Second Contract; Remodelled)	2,000,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000

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for second qualities, about 12s. 6d.; and for steam smalls, 4s. 6d. In gas coals, there is a rather reduced local consumption; but the shipping season has begun to the Baltic, and the effect of the Welsh strike has been to throw a few additional and pressing orders into this market. Prices thus are very varying; but for coals for immediate need 8s. 9d. per ton f.o.b. has to be paid. Two heavy contracts for gas coal are in the market; and in one case the matter is held over owing to the high prices. In the second instance—that of a large local company—it is expected that the price will show an advance of about 4½d. per ton on that which ruled under the last contracts. There is little or no alteration in the prices of other kinds of coal. Gas coke is generally steady, with prices unchanged this week.

Scotch Coal Trade.—Though there is still a very large demand for coal—except for house varieties, which are, in consequence, being offered for shipment—prices are showing a tendency to recede. In Fifeshire, a settlement was come to with the miners last week, by which they are to receive an advance of 25 per cent. A great access of trade in the country is expected. In the West of Scotland, the leaders of the men are urging them to make a demand for a further advance of 6d. per day in wages. There is an abundant outlet for all the coal which is being wrought. The prices quoted are: Main, 8s. 6d. to 9s. per ton f.o.b. Glasgow; ell, 9s. 6d. to 10s. 3d.; and splint, 9s. The shipments for the week amounted to 223,257 tons—an increase of 17,556 tons upon the previous week, and of 56,263 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,506,610 tons—an increase over the same period of last year of 208,203 tons.

The London County Council and the Gas Companies.—Mr. Beachcroft has placed upon the *agenda* of the London County Council a notice of motion that the Council should petition Parliament to institute an inquiry on the subject of the management, working, and charges of the London Gas Companies; the operation of the sliding-scale; and the particular complaints of consumers on the north side of the Thames that they are under a disadvantage compared with those on the south side.

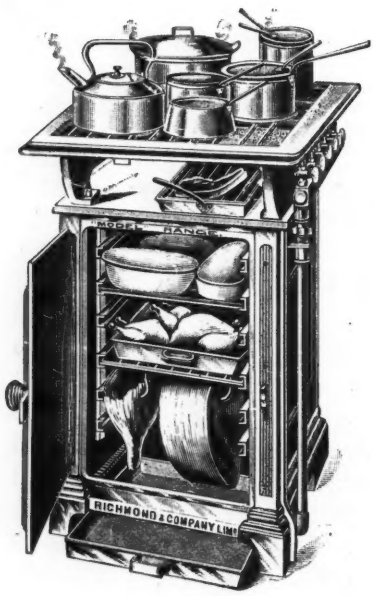
West Bromwich Gas Supply.—At the meeting of the West Bromwich Town Council on Wednesday, the Gas Committee reported that the sales of gas during the financial year ending the 31st of March last were 248,439,675 cubic feet, being an increase of 16,901,000 cubic feet compared with the previous year; and that the amount of gas-rental was £31,820, or £2492 more than before—the greater part of the increase being due to the adoption of the prepayment meter system of supply. The Manager (Mr. T. Glover) having reported to the Committee upon Messrs. Young and Glover's process for effecting economy in the enrichment of gas and preventing naphthalene deposits (see *ante*, p. 1008), they had authorized an expenditure not exceeding £100 for certain necessary alterations in the existing plant, to enable a complete trial of the process to be made. The Chairman of the Committee (Alderman A. Farley), in moving the adoption of the report, remarked that the sales of gas during the past year were very satisfactory; there being an increase of nearly 7 per cent. The report was adopted.

Longton Gas-Works.—The Town Clerk of Longton last Thursday reported to the Town Council that he had received the sanction of the Local Government Board to a loan of £20,000 for gas-works purposes.

Southport Gas Profits.—The profit of the Southport Corporation Gas Department for the past year is rather less than £7000. When the Finance Committee were preparing their budget twelve months ago, they estimated that a profit £4000 above this would be realized; so that the deficiency is no doubt causing them a little uneasiness.

The Public Lighting of Liverpool.—Mr. C. R. Bellamy, the Gas Inspector of the Liverpool Corporation, has issued his annual report on the public lighting and gas supply of the enlarged city. He remarks that the most important work during the past year has been the general extension of the incandescent gas system of street lighting. The number of incandescent gas-lamps in use at the end of the year was 1740, of which 1618 were double; the total number of incandescent burners being 3360. The total length of roads lighted at the end of the year (irrespective of passages or courts), was 415 miles—3¾ miles of these being lighted by electricity, 39¼ miles by incandescent gas-lamps; and the remainder by the ordinary system. The total gross charges connected with the public lighting of the city and the supervision of the gas supply for the year amounted to £51,639. The illuminating power of the gas is fixed at 20 candles; but the average of 299 tests at the office was 20·87 candles, and of 91 tests on the district 20·68 candles. Mr. Bellamy adds that Liverpool gas may be said to be the most severely tested for illuminating power in the kingdom.

Corporations and the Insurance of Municipal Buildings.—Last Wednesday, the Nottingham Corporation Bill came before the Police and Sanitary Regulations Committee of the House of Commons, over whom Sir Stafford Northcote is presiding. The main object of the Bill was to enable the Corporation to undertake the insurance of the municipal buildings and their contents. The preamble of the Bill stated that the Council had charge of the Town Hall, municipal buildings, college libraries, museums, and technical schools, including plant, books, pictures, works of art (the property of or on loan to the Corporation), and other property and effects, and the Council desired power to pay to an insurance fund such sums as would be equal to the aggregate amount of the premiums payable in the event of the Council insuring the buildings in some public insurance office. The Town Clerk (Sir Samuel G. Johnson) stated that the Corporation had had great difficulty in getting the art works insured at a value. The Corporation had no power to put aside from the rates any sum for the purpose of insurance without the authority of an Act. By putting by £1000 per year for 47 years they would get £100,000, which they desired to constitute an insurance fund. The ordinary revenue of the Corporation, apart from gas, water, electric lighting, and tramways, was last year £261,672. Replying to a question by the Chairman, the witness said he did not know of any corporation who had the power which they sought to obtain. After some consideration, the Chairman said the Committee were prepared to sanction the proposal; reducing the amount of the insurance fund from £100,000 to £50,000.



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The Local Government Board and the Shrewsbury Water Scheme.—A special meeting of the Shrewsbury Town Council was held a short time since to receive the report of the Local Government Board on the proposal to supply the inhabitants with water from the River Severn. The Board condemned the scheme on the ground that the Severn water was, though filtered, highly suspicious, owing to its liability to pollution from the drainage of places situated above the proposed intake. An upland scheme was suggested by the Board, and also that borings be made. The matter was referred to a Committee of the whole Council.

Oil or Electric Lighting for Barking.—A Local Government Board inquiry was recently held at the Public Offices, Barking, by Mr. W. O. E. Meade-King, M.Inst.C.E., with regard to an application by the Barking District Council for a loan of £15,000 for purposes of electric lighting. The Council, The Gaslight and Coke Company, and the Barking Gas Company were represented by Counsel. From the opening statement on behalf of the Council, it was shown that the town, although situate only eight miles from London, had been for years lighted by oil-lamps; the Council refusing to pay 4s. 6d. per 1000 cubic feet for gas. The cost of the oil-lamps was £3 1s. per lamp per annum; whereas the cost of electricity worked out at £2 13s. 10d. per annum. Witnesses were called in support of the scheme, which was strenuously opposed by members of most of the local public bodies. The majority of the Council are in favour of its adoption. The inquiry was concluded on the 30th ult.

Malvern Gas Supply.—At the meeting of the Malvern District Council last Tuesday, the report of Mr. H. P. Maybury, the Town Surveyor, who is also the Manager of the gas-works, for the year ending March 31 last was presented. It showed that during the twelve months the quantity of coal carbonized was 5188 tons; the gas made, 56,379,200 cubic feet; the yield of gas per ton of coal, 10,860 cubic feet, of 17·40-candle power; and the coke sold 8 cwt. 2 qrs. 18 lbs. per ton of coal. The number of public lamps added was 147; and 7991 yards of main were laid. The balance-sheet showed receipts amounting to £10,629, and expenditure to £8411; the profit on the year's working being £2218. Mr. Nevile moved the adoption of the report, which, he said, explained itself; and therefore he need do no more than congratulate Mr. Maybury on the very satisfactory result of the year's operations. There might be a difference of opinion in the Council with regard to the disposal of the profits—whether they should be applied to a reduction of the rates or of the price of gas; but they must all be glad that the profit had been made. Its disposal would be discussed later on. Dr. Grindrod seconded the motion. Mr. Davis remarked that twelve months ago a Committee were appointed to consider the question of the price of gas; and he asked whether the Committee had met, and with what result. The Chairman (Dr. Dixey) said no Special Committee were appointed; and as the matter was one of very considerable importance, he thought it should be a Committee of the whole Council. It was decided to hold a special meeting of the Council in Committee to deal with the question.

The Proposed Subway for Gas and Water Pipes and Electrical Cables at St. Helens.—The St. Helens Town Council last Wednesday considered the proposal to construct a subway in Church Street and Ormskirk Street, for the accommodation of the gas and water mains and the electricity, telephone, and telegraph cables. The outlay on the work is to be borne by the Paving, Gas, Water, and Electricity Committees; and application is to be made to the Local Government Board for sanction to borrow £5000—the estimated cost. In the course of the proceedings, the Town Clerk read a report drawn up by the Borough Gas and Water Engineers on the matter, which set forth that incidental to the paving of the streets with concrete and setts, and apart from the question of the subway, new gas and water mains required to be laid, as it seemed to be agreed on all hands that it would not be right to leave the gas and water mains under a concreted street. Therefore, whether the subway be made or not, certain expenditure on the mains must be incurred, and the cost in respect of services would be the same in either case. If the subway were not made, £3450 would have to be spent by the Gas and Water Committee for mains. If the subway were constructed, the cost for new gas-mains would be £750, and for new water-mains £1000. Thus the subway would save the Gas Committee £1050 and the Water Committee £650. This sum of £1700 would go to the credit of the subway, and reduce the cost to £3300. On the question as to what was to be obtained for the money, it was pointed out that there was greater ease and cheapness of inspection and repair, and in the case of gas greater safety.

Brightlingsea District Council and the Water-Works.—The Brightlingsea District Council and the Water Company have come to an agreement for the transfer of the water-works. The price to be paid is £4500.

Four Gallons of Water per Head per Day!—At the meeting of the Broseley District Council last Wednesday, a letter was read from the Local Government Board refusing to sanction a loan of £2750 for carrying out a water scheme for the town, on the ground that the supply proposed—4 gallons per head per day—was insufficient.

Pontypridd Water-Works Shares.—Yesterday week, the Directors of the Pontypridd Water Company opened tenders for 1500 new ordinary shares of £10 each; further capital being required for the completion of new works. A large number of tenders had been received; and the premium from the sale of the issue amounts to nearly £9500.

Littlehampton Water Supply.—The Duke of Norfolk has contributed £3000 towards the expenses of carrying out a permanent scheme of water supply for Littlehampton. At the meeting of the Urban District Council on Monday last week, his Grace was thanked for his munificence; the above-named sum being nearly one-third of the estimated total cost of the undertaking.

Stafford Corporation Water Department.—According to the annual report of the Stafford Corporation Water Committee, the water-rental for the past financial year was £4152, or an increase of 3½ per cent., and the available profit £2441. The Committe have placed £650 to the credit of the district fund, as compared with £500 last year. The sum of £1586 has been expended at Milford in connection with work to augment the supply of water. The total capital outlay on the water-works now amounts to £44,492. During the year 123 million gallons of water were raised, which is 6 millions more than in 1896-7. This is equal to 14·65 gallons per head.

The Cray Water Scheme of the Swansea Corporation.—On behalf of the Local Government Board, Colonel Boulnois has held an inquiry at Swansea relative to an application by the Corporation for permission to raise a loan of £100,000 to carry out the Cray water scheme. The Deputy Town Clerk (Mr. H. Jevons) explained that at present the Corporation had simply a contract for laying the line of pipes. The Act gave them the right to borrow £270,000, and more with the sanction of the Local Government Board. The sum of £97,406 had already been spent; and the lowest tender received for the work was £255,747. In reply to questions by the Inspector, it was elicited that the Cray valley covers 2670 acres. Originally, it was intended to lay first a 14-inch pipe-line, and second a 19-inch one. It was now proposed to lay a 17-inch main, to be followed by a 24-inch one. The Town Clerk asked that the period for repayment should be made as long as possible.

Messrs. R. & A. Main, Limited, have just issued their summer list, which they are prepared to supply with the name of any gas company printed thereon, if required.

At the Mart, Tokenhouse Yard, to-morrow, Mr. Alfred Richards will offer gas and water stocks and shares in the Southend Water Company, and the Lewes, Epping, West Ham, and Chigwell Gas Companies.

Some time ago, the Directors of the Weymouth Gas Company had laid before them by their Engineer and Manager (Mr. J. Lowe) an exhaustive report as to the desirability of extending their works to meet the growing demand for gas; and it was adopted in its entirety. A large portion of the extensions have already been placed in the hands of Messrs. Cockey and Sons, Limited; and it is hoped they will be available for the winter season.

Exhibitions of gas appliances have lately been held by the following firms: Messrs. R. & A. Main, Limited, at Birkenhead, Douglas (Isle of Man), and Salford. Messrs. W. Parkinson and Co., at Levenshulme, Manchester, with lectures by Miss E. Sanderson. Messrs. Richmond and Co., Limited, at St. Ives, with lectures by Miss Stansfield; at Sydenham, with lectures by Miss Lennard; and at Tottenham, with lectures by Miss Beeton.

The Economical Gas Apparatus Construction Company, Limited, have this year received several large orders in America, among them for water-gas plant at Buffalo and Winnipeg (Man.). They have also recently entered into a second contract with the Colchester Gas Company. It is interesting to learn that in every instance, with one exception, where provision has been made for the duplication of the carburetted water-gas plant erected by this firm, the second order has been given.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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[For Illustrated Advertisement, see May 3, p. 1029.]

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HY. G. STEAVENSON,
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WILLIAM H. NUTTER,
Secretary and Manager,
Gas Offices, St. Annes-on-the-Sea,
May 5, 1898.

CONTRACT FOR GASHOLDER TANK.

THE Directors of the Eastbourne Gas Company are prepared to receive TENDERS for the Construction of a GASHOLDER TANK, 160 feet diameter by 30 feet deep, in accordance with the Drawings and Specification which may be seen at the Office of the Company at Eastbourne, and of which Copies and Particulars may be obtained on application to the Engineer, Mr. H. E. Jones, Harford Street, Stepney.
Sealed Tenders, marked on the outside, to be delivered to me on or before the 4th day of June, 1898.
The Directors will not be bound to accept the lowest or any Tender.
(Signed) J. H. CAMPION COLES,
Secretary.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS are required as follows:—
For CRAVEN or DERBYSHIRE LIME.
For WROUGHT-IRON TUBES.
For PRESSED and COMMON RED BRICKS.
Forms of Tender may be obtained on application to the undersigned.
Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Wednesday, the 18th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings, Leeds,
May 7, 1898.

RHYL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the Rhyl Urban District Council invite TENDERS for the supply of 3500 Tons of best screened GAS COAL for One Year, from the 1st of July, 1898, to be delivered at the Rhyl Station, in such monthly quantities as may be required.
Further Information and Forms of Tender to be obtained from Mr. Leonard G. Hall, Gas Engineer and Manager.
Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Chairman of the Gas Committee, Clwyd Street Offices, Rhyl, on or before the 20th of May, 1898.
The Committee do not bind themselves to accept the lowest Tender.
ARTHUR ROWLANDS,
Clerk to the Council.
Council Office, Rhyl,
May 7, 1898.

RHYL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the Rhyl Urban District Council are prepared to receive TENDERS for the purchase of the bulk of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during a period of one or more Years, commencing the 1st of July, 1898.
Further Information may be obtained from Mr. Leonard G. Hall, Gas Engineer.
Sealed Tenders, endorsed "Tender for Tar and Ammoniacal Liquor," to be addressed to the Chairman of the Gas Committee, Clwyd Street Offices, Rhyl, on or before the 20th of May, 1898.
The Committee do not bind themselves to accept the highest or any Tender.
ARTHUR ROWLANDS,
Clerk to the Council.
Council Offices, Rhyl,
May 7, 1898.

THE URBAN DISTRICT COUNCIL OF LYMM.
(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the supply of GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of One Year from the 1st day of July, 1898.
The probable quantity required will be about 1300 Tons, which must be freshly wrought, and well screened, and free from Sulphurous Pyrites or other objectionable matter; but the Council reserve the right of increasing or decreasing the quantity named.
The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton delivered alongside the Works, to be sent to Mr. Wm. Mullard, Clerk to the Council, on or before the 19th day of May, 1898, endorsed "Coal Tender."
The Council have no special Form of Tender, and do not bind themselves to accept the lowest or any Tender.
Further Particulars may be had on application to
ROBERT SURTEES,
Manager.
Gas-Works, Lymm, Cheshire,
May 5, 1898.

THE URBAN DISTRICT COUNCIL OF LYMM.
(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1898.
The Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.
The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton for Tar and price per ton for Liquor (5° Twaddel), to be sent to Mr. Wm. Mullard, Clerk to the Council, on or before the 19th day of May, 1898, endorsed "Tar Tender."
The Council do not bind themselves to accept the highest or any Tender.
Further Particulars may be had on application to
ROBERT SURTEES,
Manager.
Gas-Works, Lymm, Cheshire,
May 5, 1898.

THE East Dereham Urban District Council are prepared to receive TENDERS for the supply of about 1300 Tons of screened GAS COAL for the ensuing Year.
Conditions and Forms of Tender to be had of the undersigned.
Tenders to be sent in by the 30th of May, 1898, to
B. H. VORES,
Clerk to Urban District Council.
East Dereham.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for One Year.
Sealed Tenders, addressed to the Chairman, J. W. Watkinson, Esq., to be delivered on or before Wednesday, May 25.
Forms of Tender or any further Information required may be obtained from the undersigned.
T. L. SHEPPARD,
Manager.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee are prepared to receive TENDERS for the supply of about 113,000 Tons of COAL and CANNEL required by them during the Year ending the 30th of June, 1899.
Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, the 24th inst.
A. NICHOLSON,
Town Clerk.
May 4, 1898.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the supply of 3500 Tons of screened GAS COAL or Washed NUTS, and 250 Tons of CANNEL or CANNEL NUTS, during the Year ending the 30th of June, 1899.
Specification and Form of Tender may be obtained from the undersigned.
Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, not later than Wednesday, the 18th inst.
W. ORME,
Manager.

TAR AND LIQUOR.

THE Gas Committee of the Borough of Congleton invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works, from July 1, 1898, to June 30, 1899.
Further Particulars may be obtained from the undersigned.
Sealed Tenders, endorsed "Tar and Liquor," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, not later than Wednesday, the 18th inst.
WM. ORME,
Manager.

FENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply and delivery of 5000 to 7000 Tons of BURGY or NUTS.
Particulars and Form of Tender can be obtained from the Manager.
Tenders, endorsed "Coal," are to be forwarded to the Chairman, Gas Offices, Fenton, on or before Monday, May 23, 1898.
F. H. DARWIN,
Manager and Secretary.
Gas Offices, Fenton,
May 5, 1898.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for the COAL and CANNEL required at their Works during a period of One or Two Years.
Forms of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, to be delivered to me before Three p.m. on Thursday, May 19, 1898.
By order,
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
May 7, 1898.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TO PIPE FOUNDERS.

THE Gas Commissioners are prepared to receive TENDERS for the supply of 15-inch CAST-IRON SPIGOT and FAUCET MAIN PIPES and sundry CONNECTIONS, and their delivery to various Stations on the North British Railway.
Specifications and full Particulars may be obtained from Mr. W. R. Herring, Chief Engineer and Manager, New Street Gas-Works, Edinburgh.
Tenders to be lodged with the undersigned on or before the 30th day of May, 1898, at Ten a.m., endorsed "Tender for Main Pipes."
The Commissioners do not bind themselves to accept the lowest or any Offer.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place, Edinburgh,
May 3, 1898.

TENDERS FOR GAS COAL.

THE Directors of the Cheltenham Gas-Light and Coke Company invite TENDERS for the supply of 34,000 Tons of GAS COAL extending over a period of Twelve Months from the 1st of August next.

Particulars may be obtained from the undersigned, to whom Tenders, endorsed "Tender for Coal," must be delivered on or before Thursday, the 19th of May.

The Directors do not bind themselves to accept the lowest or any Tender.

R. O. PATERSON.

Gas-Works, Cheltenham,
April 30, 1898.

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for about 540 feet of STOURBRIDGE or other approved quality FIRE-CLAY RETORTS, 22 in. by 16 in., about 18,000 FIRE-BRICKS, TILES, and about 10 Tons of CLAY.

Tenders to be sent in on or before noon on Monday, the 16th of May, 1898, addressed to the Chairman of the Gas and Water Accounts Committee, Hardres Street, Ramsgate, endorsed "Tender for Fire-Clay Goods."

Specification and full Particulars on application to

WILLIAM A. VALON,
Engineer.

BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, are prepared to receive TENDERS from Colliery Proprietors for the supply of 25,000 Tons, or a portion thereof, of best screened GAS COAL.

Forms of Tender and Conditions of Supply may be obtained upon application at my Office; and sealed Tenders, endorsed "Coal," are to be delivered to me at or before Ten a.m. on the 25th day of May inst.

The Council do not bind themselves to accept the lowest or any Tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas and Electric Light Works,
Wetmore Road, Burton-upon-Trent,
May 4, 1898.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.
TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 1500 Tons of CANNEL and 6500 Tons of best screened GAS COAL, delivered at Mansfield Station, for One Year, from the 1st of June, 1898, to the 31st of May, 1899.

TAR AND LIQUOR.

TENDERS for surplus TAR and LIQUOR made during the Year, from the 1st of July, 1898, to the 30th of June, 1899. Tenders for Liquor to be made either at a fixed price per Ton or on the Sliding-Scale regulated by the price of Sulphate.

Tenders, endorsed, to be sent to J. Harrop White, Esq., Deputy Town Clerk, Mansfield, on or before the 27th of May, 1898.

Particulars and all other Information from the undersigned.

No special Form of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
May 3, 1898.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY AND OTHER OWNERS.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Wednesday, May 11, at Two o'clock, in Lots:—

500 £10 SHARES in the SOUTHEND WATER-WORKS COMPANY; also STOCKS and SHARES in the LEWES GAS COMPANY; WEST HAM GAS COMPANY, CHIGWELL, LOUGHTON, and WOODFORD GAS COMPANY, and EPPING GAS COMPANY.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

ALDERSHOT GAS AND WATER COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, June 6, at Two o'clock, in Lots, 150 £10 ORDINARY SHARES in the above Company, ranking for a Maximum Dividend of 7 per cent.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

KING'S LYNN GAS COMPANY.

Issue of £4000 PREFERENCE 4 PER CENT. STOCK under the King's Lynn Gas Order, 1888, confirmed by the Gas Orders Confirmation (No. 2) Act, 1888.

NOTICE is Hereby Given, that, on the 31st of May, 1898, the Directors will receive TENDERS for the purchase of £4000 PREFERENCE 4 PER CENT. STOCK in 40 Lots of £100 each.

Printed Conditions and Forms of Tender may be had on application, by post or otherwise, to the Manager, Gas-Works, King's Lynn, or to the undersigned.

By order,
J. J. COULTON,
F. H. PARTRIDGE, } Clerks.

Lynn, May 6, 1898.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 3rd inst.

THOMAS HENRY GOODWIN NEWTON, Esq., in the Chair, when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended the 31st of December last be declared upon the £3,300,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 10th of May next.

"That Colonel Josiah Wilkinson, be re-elected a Director of the Association."

"That Arthur Lucas, Esq., C.E., be re-elected a Director of the Association."

"That Clarence Pigou, Esq., be re-elected a Director of the Association."

"That Montagu Somes Pilcher, Esq., be re-elected an Auditor of the Association."

Cordial Votes of Thanks were passed to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the chair, and to the Staff in London and on the Continent.

By order of the Board,
ROBT. W. WILSON,
Secretary.

31, Austin Friars, London, E.C.,
May 4, 1898.

ABSOLUTELY SAFE INVESTMENTS.

MESSRS. LOVE & COOPER, Stock and Share Brokers, Portsmouth, have at the moment SHARES in the following Companies FOR SALE:—

PORTSEA ISLAND GAS COMPANY—An exceptionally strong Company, with a Reserve Fund equal to one-quarter of its Capital. Several £50 SHARES, at Prices to pay 4½ per cent.
WINCHESTER WATER AND GAS COMPANY—£25 fully-paid 7 per cent. SHARES.
HERNE BAY WATER COMPANY—6 per cent. PREFERENCE STOCK.
£1000 SOUTHAMPTON GAS COMPANY'S 5 per cent. PERPETUAL DEBENTURE STOCK.
HORSHAM GAS COMPANY, now paying full Maximum Dividends of 10 per cent.
FAREHAM GAS COMPANY, now paying 6 per cent.
PORTSMOUTH WATER-WORKS COMPANY, paying full Maximum Dividends of 10 per cent.
SOUTH HANTS WATER-WORKS COMPANY.
GOSPORT WATER-WORKS COMPANY.
WOKING WATER AND GAS COMPANY.

Full detailed Particulars and Prices forwarded on application to LOVE AND COOPER, Stock and Share Brokers, PORTSMOUTH.

BRISTOL WATER-WORKS COMPANY.

SALE OF
DEBENTURE STOCK AND
ORDINARY STOCK.

ALEXANDER, DANIEL, AND CO., will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 19th of May, 1898, at Two o'clock in the Afternoon.

£20,000
BRISTOL WATER-WORKS 3½ PER CENT.
DEBENTURE STOCK,
IN LOTS OF £100 STOCK,
At the Reserved Price of £124 for every £100 Stock,
AND
£10,000
BRISTOL WATER-WORKS 7 PER CENT.
MAXIMUM CONSOLIDATED
ORDINARY STOCK,
IN LOTS OF £100 STOCK,
At the Reserved Price of £154 for every £100 Stock.

The above £20,000 3½ per cent. Debenture Stock has been created under the powers of the Bristol Water-Works Act, 1888; and the above £10,000 7 per cent. Maximum Consolidated Ordinary Stock is part of the 7 per cent. Maximum Ordinary Stock, amounting to £690,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, and 1895.

The Dividend on the above *Ordinary* Stock is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent Years.

For further Particulars and Conditions of Sale, apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL (and 3, Gracechurch Street, LONDON, E.C.); to FUSSELL AND CO., Solicitors, 36, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Small Street, Bristol.

BY EDWIN FOX AND BOUSFIELD.

AT THE AUCTION MART, ON WEDNESDAY, MAY 18, AT TWO, IN LOTS.

By Order of the Court of Directors, and pursuant to the Auction Clauses of the Company's Act of 1878.

GRAND JUNCTION WATER-WORKS COMPANY—£80,000 NEW CAPITAL, in 600 £50 NEW SEVEN PER CENT. SHARES, in such Lots as, while enabling the large Capitalist readily to acquire a considerable holding, will admit the smaller Investor to participate in the advantages of an interest in this well-known London Water Company. The above Shares form part of, and have the same power and privileges as the existing Ordinary Capital of the Company, and are entitled to a Dividend not exceeding 7 per cent. per annum. The Gross Rental in 1873 was £105,249; and in 1897, it amounted to £209,825—an increase to nearly cent. per cent. in 25 years. In Lots of two Shares each. The Buyer of one Lot will have the right of taking further Lots at a like Price per Share without competition.

Particulars of the SECRETARY of the Company, at the Chief Offices, 65, South Molton Street, OXFORD STREET, W.; at Messrs. EDWIN FOX AND BOUSFIELD'S OFFICE, 99, Gresham Street, BANK, E.C.; and of the Company's Solicitors,

MESSRS. BIRCHAM AND CO.,
46, Parliament Street, S.W.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

Telephone: Castleford No. 215. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.

ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

GAS PURIFICATION BY
HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

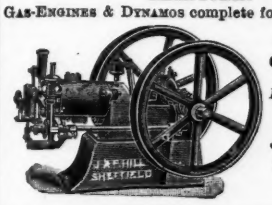
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HILL'S IMPROVED

"OTTO" TYPE GAS-ENGINES

½ H.P. to 20 H.P. Specially designed for Users of Small Power.

GAS-ENGINES & DYNAMOS complete for HOTEL, HOUSE, and SHOP Installations.
Gas-Engines and Pumps.
High-Class Workmanship.



J. & P. HILL,
Backfields & Norfolk Iron-Works,
SHEFFIELD.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

REGENERATIVE RETORT-SETTINGS.

J. FIRTH BLAKELEY & CO., GAS ENGINEERS AND CONTRACTORS, RAVENSTHORPE, YORKS,

Have made arrangements with Mr. ALEXANDER YUILL, of Alloa, N.B., for the SOLE RIGHT of BUILDING his REGENERATIVE FURNACES and SETTINGS OF RETORTS.
By Mr. Yuill's Principle, the maximum quantity of Gas per Retort per diem may be obtained with the minimum amount of fuel.
Gas Managers who are desirous of improving their Settings should ask for Particulars and Prices before adopting any other principle.
They give the best results, are reliable, and economical in construction.

GAS APPARATUS OF ALL KINDS SUPPLIED.

BOWENS' Ltd. Successors,

STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

OSLER,

BIRMINGHAM.

MANUFACTURERS OF GASELIERS IN GLASS AND METAL.

D. HULETT & CO., LTD.,

55 & 56, HIGH HOLBORN, LONDON.

"HANDY" SERVICE CLEANSERS.

Light and Powerful. Price 50s. each.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES AND FITTINGS.
STREET LAMPS & COLUMNS.

Price Lists on Application.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7089.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

Fig. 705. "SINGLE RAM" STEAM-PUMP.

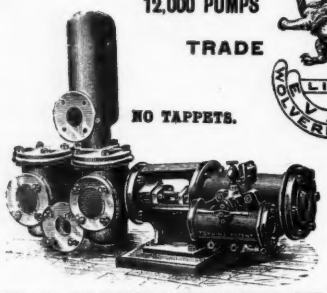


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

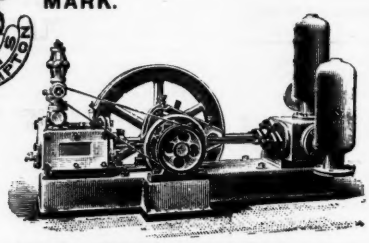


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

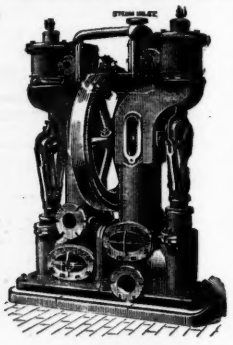
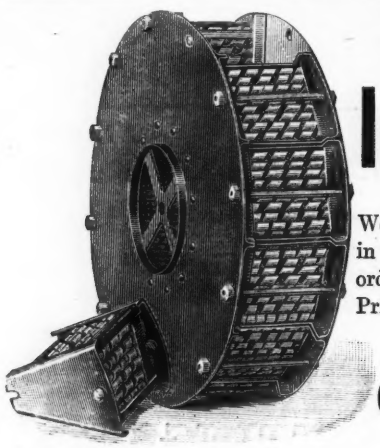


Fig. 712 "DOUBLE-RAM" STEAM-PUMP.



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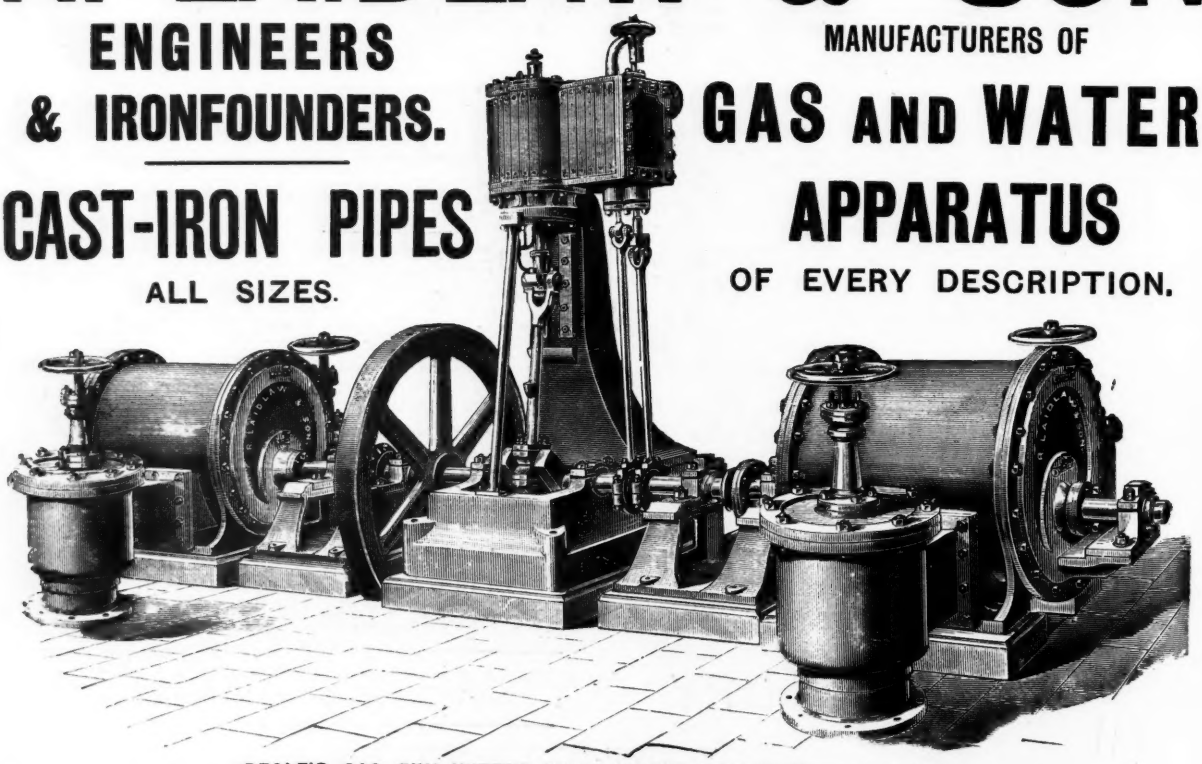

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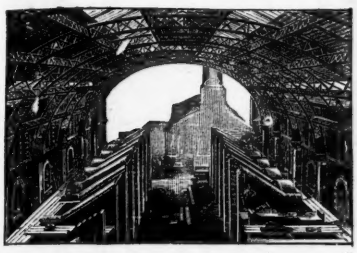

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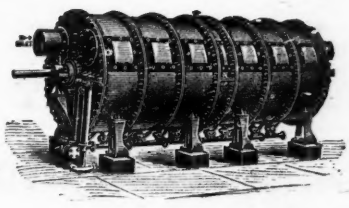

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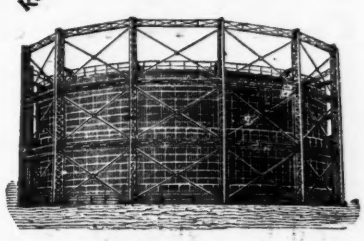

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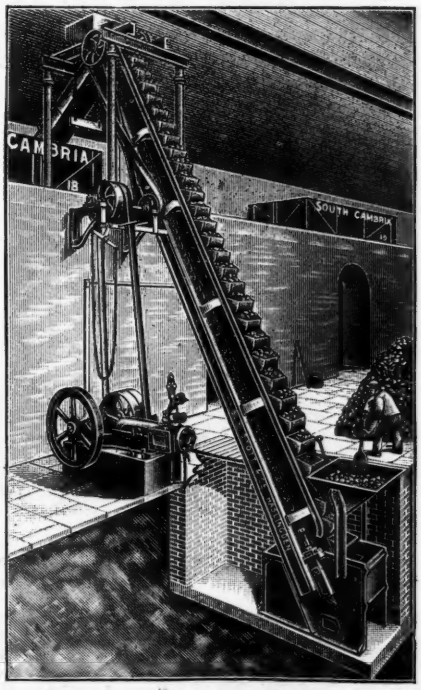

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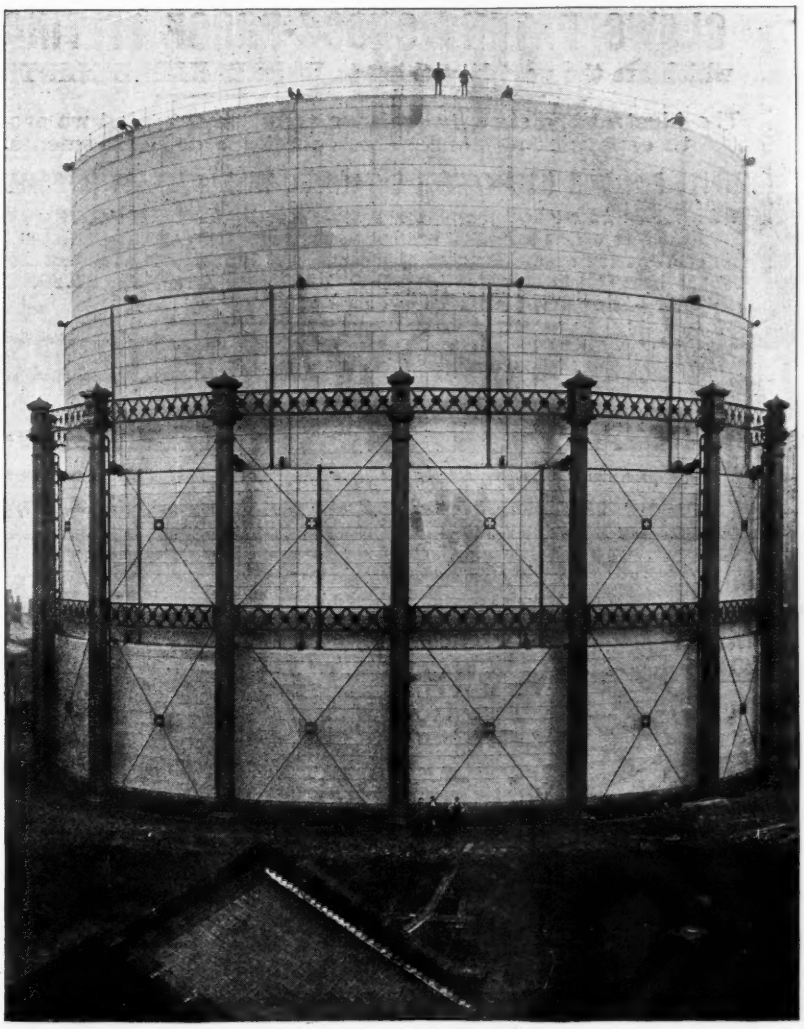

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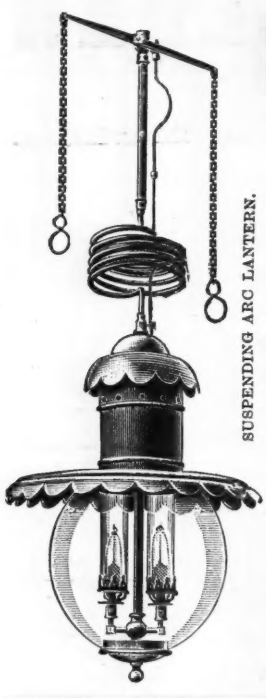

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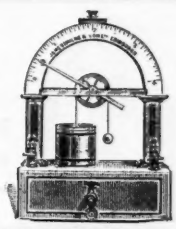

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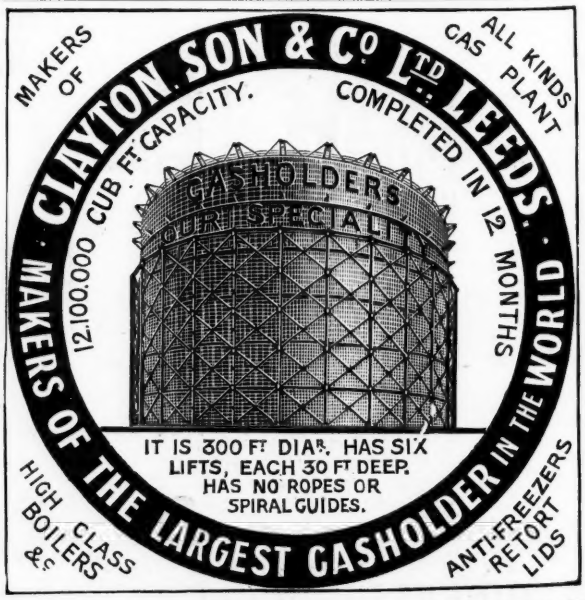
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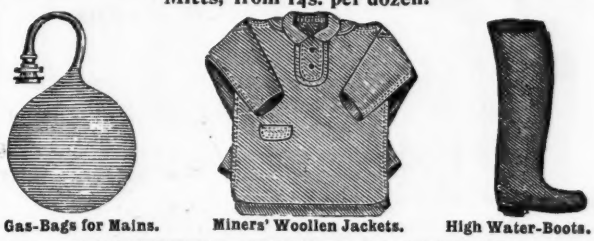

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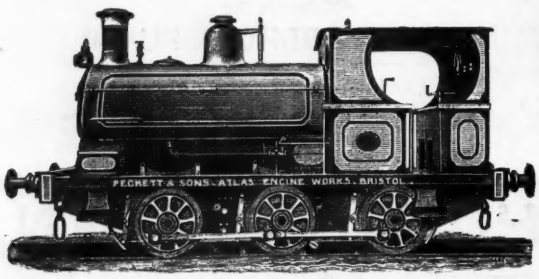

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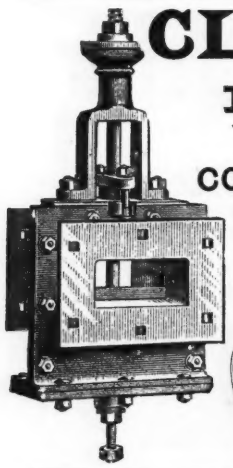

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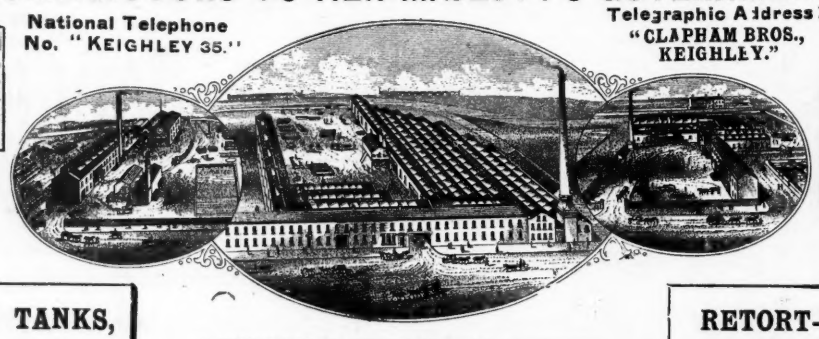

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